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The Program in the History of the Biological Sciences and Biotechnology

Robert A. Swanson, M.S.

CO-FOUNDER, CEO, AND CHAIRMAN OF GENENTECH, INC., 1976-1996

With Introductions by
Arthur D. Levinson, Ph.D.
and
Kenneth P. Morse, M.B.A

Interviews Conducted by
Sally Smith Hughes, Ph.D.
in 1996 and 1997

Since 1954 the Regional Oral History Office has been interviewing leading participants in or well-placed witnesses to major events in the development of northern California, the West, and the nation. Oral history is a method of collecting historical information through tape-recorded interviews between a narrator with firsthand knowledge of historically significant events and a well-informed interviewer, with the goal of preserving substantive additions to the historical record. The tape recording is transcribed, lightly edited for continuity and clarity, and reviewed by the interviewee. The corrected manuscript is indexed, bound with photographs and illustrative materials, and placed in The Bancroft Library at the University of California, Berkeley, and in other research collections for scholarly use. Because it is primary material, oral history is not intended to present the final, verified, or complete narrative of events. It is a spoken account, offered by the interviewee in response to questioning, and as such it is reflective, partisan, deeply involved, and irreplaceable.

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Robert A. Swanson, circa 1990

Cataloguing information

SWANSON, ROBERT A. (1947-1999) Corporate executive, venture capitalist

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Florida family background; education at MIT, 1965-1970; early career at Citicorp and Kleiner & Perkins Venture Capital, 1970-1975; corporate executive, Genentech, 1976-1996: founding, financing, staffing the company; somatostatin, insulin, growth hormone, and other projects; university-industry relations/tensions; business strategy & plans; initial public offering; corporate culture; intellectual property; joint ventures; recombinant DNA controversy. Comments on Thomas D. Kiley, David Packard, Thomas Perkins, and others.

Introductions by Arthur D. Levinson, Ph.D., CEO & Chairman, Genentech, Inc., and Kenneth P. Morse, M.B.A, Managing Director, MIT Entrepreneurship Center.

Interviewed in 1996 and 1997 by Sally Smith Hughes, Ph.D., Regional Oral History Office, for the Program in the History of the Biological Sciences and Biotechnology, The Bancroft Library, University of California, Berkeley.

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BIOTECHNOLOGY SERIES HISTORY--Sally Smith Hughes, Ph.D.

Genesis of the Program in the History of the Biological Sciences and Biotechnology

In 1996, a long-held dream of The Bancroft Library came true with the launching of its Program in the History of the Biological Sciences and Biotechnology. For years, Bancroft had wished to document the history of the biological sciences on the Berkeley campus, particularly its contributions to the development of molecular biology. Bancroft has strong holdings in the history of the physical sciences--the papers of E.O. Lawrence, Luis Alvarez, Edwin McMillan, and other campus figures in physics and chemistry, as well as a number of related oral histories. These materials support Berkeley's History of Science faculty, as well as scholars from across the country and around the world.

Although the university is located next to the greatest concentration of biotechnology companies in the world, Bancroft had no coordinated program to document the industry nor its origins in academic biology. For a decade, the staff of the Regional Oral History Office had sought without success to raise funds for an oral history program to record the development of the industry in the San Francisco Bay Area. When Charles Faulhaber arrived in 1995 as Bancroft's new director, he agreed to the need to establish a Bancroft program to capture and preserve the collective memory and papers of university and corporate scientists and the pioneers who created the biotechnology industry. He too saw the importance of documenting the history of a science and industry which influences virtually every field of the life sciences, generates constant public interest and controversy, and raises serious questions of public policy. Preservation of this history was obviously vital for a proper understanding of science and business in the late twentieth century.

Bancroft was the ideal location to launch such an historical endeavor. It offered the combination of experienced oral history and archival personnel, and technical resources to execute a coordinated oral history and archival program. It had an established oral history series in the biological sciences, an archival division called the History of Science and Technology Program, and the expertise to develop comprehensive records management plans to safeguard the archives of individuals and businesses making significant contributions to molecular biology and biotechnology. It also had longstanding cooperative arrangements with UC San Francisco and Stanford University, the other research universities in the San Francisco Bay Area. The history of biotech project was to provide a basis for continuing collaboration among the three institutions in the documentation of recent science and technology through oral history and archival collection. The only ingredient missing was funding.

In April 1996, the dream became reality. Daniel E. Koshland, Jr. provided seed money for a center at The Bancroft Library for historical research on the biological sciences and biotechnology. Thanks to this generous gift, Bancroft has begun to build an integrated collection of research materials--primarily oral history transcripts, personal papers, and archival collections--related to the history of the biological sciences and biotechnology in university and industry settings. One of the first steps was to create a board composed of distinguished figures in academia and industry who advise on the direction of the oral history and archival components. The Program's initial concentration is on the San Francisco Bay Area and northern California. But its ultimate aim is to document the growth of molecular biology as an independent field of the life sciences, and the subsequent revolution which established biotechnology as a key contribution of American science and industry.

UCSF Library, with its strong holdings in the biomedical sciences, is a collaborator on the archival portion of the Program. David Farrell, Bancroft's curator of the History of Science and Technology, serves as liaison. In February 1998, Robin Chandler, head of UCSF Archives and Special Collections, completed a survey of corporate archives at local biotechnology companies and document collections of Berkeley and UCSF faculty in the biomolecular sciences. The ultimate aim is to ensure that personal papers and business archives are collected, cataloged, and made available for scholarly research.

Project Structure

With the board's advice, Sally Hughes, a science historian at the Regional Oral History Office, began lengthy interviews with Robert Swanson, a co-founder and former CEO of Genentech in South San Francisco; Arthur Kornberg, a Nobel laureate at Stanford; and Paul Berg, also a Stanford Nobel laureate. A short interview was conducted with Niels Reimers of the Stanford and UCSF technology licensing offices. These oral histories build upon ones conducted in the early 1990s, under UCSF or Stanford auspices, with scientists at these two universities.¹ The oral histories offer a factual, contextual, and vivid personal history that enriches the archival collection, adding information that is not usually present in written documents. In turn, the archival collections support and provide depth to the oral history narrations.

¹Hughes conducted oral histories with Herbert Boyer, William Rutter, and Keith Yamamoto of UCSF, and with Stanley Cohen of Stanford. To date, the first volume of the oral history with Dr. Rutter is available at the Bancroft and UCSF libraries; transcripts of the other interviews are currently under review by the interviewees.

Primary and Secondary Sources

This oral history program both supports and is supported by the written documentary record. Primary and secondary source materials provide necessary information for conducting the interviews and also serve as essential resources for researchers using the oral histories. The oral histories also orient scholars unfamiliar with the field or the scientist to key issues and participants. Such orientation is particularly useful to a researcher faced with voluminous, scattered, and unorganized primary sources. This two-way "dialogue" between the documents and the oral histories is essential for valid historical interpretation.

Beginning with the first interviews in 1992, the interviewer has conducted extensive documentary research in both primary and secondary materials. She gratefully acknowledges the generosity of the scientists who have made their personal records available to her: Paul Berg, Stanley Cohen, Arthur Kornberg, William Rutter, and Keith Yamamoto. She also thanks the archivists at Bancroft, UCSF, and Stanford libraries, and personnel at Chiron, Genentech, and Stanford's Office of Technology Licensing, for assistance in using archival collections.

Oral History Process

The oral history methodology used in this program is that of the Regional Oral History office, founded in 1954 and producer of over 1,600 oral histories. The method consists of research in primary and secondary sources; systematic recorded interviews; transcription, light editing by the interviewer, and review and approval by the interviewee; library deposition of bound volumes of transcripts with table of contents, introduction, interview history, and index; cataloging in UC Berkeley and national online library networks (MELVYL, RLIN, and OCLC); and publicity through ROHO news releases and announcements in scientific, medical, and historical journals and newsletters and via the ROHO and UCSF Library Web pages.

Oral history as a historical technique has been faulted for its reliance on the vagaries of memory, its distance from the events discussed, and its subjectivity. All three criticisms are valid; hence the necessity for using oral history documents in conjunction with other sources in order to reach a reasonable historical interpretation.¹ Yet these acknowledged weaknesses of oral history, particularly its subjectivity, are also its strength. Often individual perspectives provide information unobtainable through more traditional sources. Oral history in skillful hands provides the context in which events occur--the social, political, economic, and

¹The three criticisms leveled at oral history also apply in many cases to other types of documentary sources.

institutional forces which shape the course of events. It also places a personal face on history which not only enlivens past events but also helps to explain how individuals affect historical developments.

An advantage of a series of oral histories on a given topic, in this case molecular biology and biotechnology, is that the information each contains is cumulative and interactive. Through individual accounts, a series can present the complexities and interconnections of the larger picture. Thus the whole (the series) is greater than the sum of its parts (the individual oral histories), and should be considered as a totality.

Emerging Themes

Although the oral history program is still in its infancy, several themes are emerging. One is "technology transfer," the complicated process by which scientific discovery moves from the university laboratory to industry where it contributes to the manufacture of commercial products. The oral histories show that this trajectory is seldom a linear process, but rather is influenced by institutional and personal relationships, financial and political climate, and so on.

Another theme is the importance of personality in the conduct of science and industry. These oral histories testify to the fact that who you are, what you have and have not achieved, whom you know, and how you relate has repercussions for the success or failure of an enterprise, whether scientific or commercial. Oral history is probably better than any other methodology for documenting these personal dimensions of history. Its vivid descriptions of personalities and events not only make history vital and engaging, but also contribute to an understanding of why circumstances occurred in the manner they did.

Molecular biology and biotechnology are fields with high scientific and commercial stakes. As one might expect, the oral histories reveal the complex interweaving of scientific, business, social, and personal factors shaping these fields. The expectation is that the oral histories will serve as fertile ground for research by present and future scholars interested in any number of different aspects of this rich and fascinating history.

Update, September 2001

In early 2001, the Program in the History of the Biological Sciences and Biotechnology was given great impetus by Genentech's generous pledge of one million dollars to support documentation of the biotechnology industry. At an initial meeting of Genentech and Library personnel in November 2000, it was agreed that the initial phase of the Genentech-supported project in the company's twenty-fifth anniversary year should focus on oral histories

with current and former Genentech employees. Archival collection, on the other hand, was designated as a long-term process because of the greater necessity to gather oral documentation while minds are clear and because of Genentech's present need to retain many corporate documents for legal and other reasons.

On October 15, 2001, The Bancroft Library will celebrate Genentech's twenty-fifth anniversary and acknowledge its generosity to the Program by formally presenting the oral histories of Herbert W. Boyer and Robert A. Swanson, the company's founders. Oral histories are currently in progress with the following individuals presently or formerly at Genentech: David Goeddel, Arthur Levinson, Fred Middleton, Richard Scheller, and Daniel Yansura. Oral histories are also completed or in progress with individuals at Chiron Corporation and Tularik, Inc. The next phase will expand documentation to other biotechnology companies.

Location of the Oral Histories

Copies of the oral histories are available at the Bancroft, UCSF, and UCLA libraries. They also may be purchased at cost through the Regional Oral History Office. Some of the oral histories, with more to come, are available on The Bancroft Library's History of the Biological Sciences and Biotechnology Website: <http://www.lib.berkeley.edu/BANC/Biotech/>.

Sally Smith Hughes, Ph.D.
Historian of Science

Regional Oral History Office
The Bancroft Library
University of California, Berkeley
October 2001

October 2001

ORAL HISTORIES ON BIOTECHNOLOGY

Program in the History of the Biological Sciences and Biotechnology

Paul Berg, Ph.D., "A Stanford Professor's Career in Biochemistry, Science Politics, and the Biotechnology Industry," 2000

Herbert W. Boyer, Ph.D., "Recombinant DNA Science at UCSF and Its Commercialization at Genentech," 2001

Arthur Kornberg, M.D., "Biochemistry at Stanford, Biotechnology at DNAX," 1998

"Regional Characteristics of Biotechnology in the United States: Perspectives of Three Industry Insiders" (Hugh D'Andrade, David Holveck, and Edward Penhoet), 2001

Niels Reimers, "Stanford's Office of Technology Licensing and the Cohen/Boyer Cloning Patents," 1998

William J. Rutter, Ph.D., "The Department of Biochemistry and the Molecular Approach to Biomedicine at the University of California, San Francisco," 1998

Robert A. Swanson, "Co-founder, CEO, and Chairman of Genentech, 1976-1996," 2001

Oral histories in process:

Stanley Cohen

David Goeddel

Daniel Koshland

Marian E. Koshland retrospective

Arthur Levinson

Fred Middleton

Richard Scheller

Keith R. Yamamoto.

INTRODUCTION by Arthur D. Levinson

I met Bob in 1979 while I was concluding a postdoctoral fellowship at the University of California, San Francisco. I wanted to learn more about emerging cloning technologies so I talked first to Herb Boyer at UCSF and then to his partner, Bob Swanson, about what their fledgling biotech company Genentech had to offer. I was so cautious about my interest that I didn't want to call Genentech from my lab--I recall using a pay phone down the street instead.

Bob and Herb painted a compelling picture. It was Bob's vision and Herb's scientific genius that convinced me to join their newly formed company. I was also extremely impressed with the caliber of other scientists who joined Genentech very early on. And Bob had the determination, energy, ambition and an aura of self-confidence that betrayed no doubts. He had the belief that we could be part of a revolution and do great things, although the technical hurdles were immense.

As Bob discussed his views of how biotechnology could change the world, I became convinced that the technology indeed held the potential to create novel therapeutics that would help people in ways that previously could not have been imagined. And I wanted to be a part of it.

At the time I joined Genentech, most scientists in academia considered such a move career suicide--few very top people left academia to go to drug companies. Those who made that choice were often shunned by their colleagues. Although many of my academic colleagues thought me crazy and tried to convince me I was making a mistake, twenty-one years later I can tell you that joining Genentech was one of the toughest but best decisions I've ever made.

Bob had the insight that combining the best of two worlds--the resources of the corporate world with the ability to do pioneering academic-based research--could produce so much more than either on its own. And he was right.

Before joining the company, I wanted Bob's reassurance that I could continue publishing the results of my scientific research. Not only did he provide that reassurance, he encouraged publication--and not just for me, but for everyone. I published more than twenty papers in my first two years here. That tradition has continued all these years and now Genentech

is second only to MIT, coincidentally Bob's alma mater, among high-impact institutions in publishing the most highly cited scientific papers over the past twenty years.

Bob and Herb wanted to attract the best and brightest scientists. So they set out to create an environment that retained many of the other positive qualities found in academia. Bob and Herb gave us autonomy and allowed us to pursue our individual interests--to explore the boundaries of science and to discover new diseases, cures, and rules of biology--without committees and top-down directives.

Bob was an astute businessman with a very competitive nature. He applied discipline and insisted from the beginning that Genentech would be a profitable entity, focusing everyone on relatively short-term goals and outcomes. We rallied around the race to clone factor VIII and the tissue plasminogen activator gene and many other challenges, spurred on by Bob. He would ask the question, "Can we express this gene in one month? Can we get the expression up to this level by this time?" He always had his eye on the target. And where we chose to compete, we usually won. Bob's intense focus on goals was a challenge for us scientists, who were used to being left alone to pursue research and see where it took us, but it allowed us to achieve. No one more seriously embodied Henry Ford's maxim that "obstacles are those frightful things you see when you take your eyes off your goal."

In the first five years, we were able to demonstrate the technology worked, follow a business plan, and do great science. Bob understood the value and importance of aggressively patenting our inventions. Bob was a creative thinker and the first to use limited R&D partnerships to fund costly clinical trials on some of our most important products.

Bob was also one of the first to offer extremely attractive stock options to all employees, thereby inspiring everyone to share in the success of our work. "People act differently as owners than they do as employees," Bob used to say. And of course, he was right. He knew the importance of creating a work environment that placed a high premium on flexibility, work/personal balance, recognition, excellence, and fun. And, importantly, on recruiting only the best of talent.

Bob was fascinated by everything, from fermentation through product packaging. He loved to make his rounds through our labs, offices and cafeteria, and he took great joy in talking with folks and thanking us for our hard work and long hours. The unique culture at Genentech is a real tribute to Bob--the hard work, sense of purpose and sense of fun that employees share. He once said that having fun and acting silly at company

social events was his way of staying connected and breaking down any perceived barriers because of his position. This was very important to him and he worked hard at it.

In 1984 I asked to have lunch with Bob to talk to him about concerns I had about where the company was going and about an arrogant, complacent attitude I saw gradually taking hold. I remember how approachable and genuinely interested he was. He was one of us. And he made things happen that addressed my concerns.

Bob retired from Genentech in 1996 but continued to drop by to see what we were up to. Sadly, he was struck by brain cancer the following year and passed away in 1999. He was only fifty-two years old.

One of my favorite spots on our campus is our Founders Research Center. There's a beautiful metal sculpture in the courtyard--a life-size depiction of Bob and Herb's very first meeting. Just looking at it, you can feel Bob's energy as he enthusiastically pitches his vision to Herb, with Herb amazed and seemingly transfixed by what he's hearing.

After Bob's death, we decorated the sculpture with flowers and memorabilia--and, from time to time, we still do.

Few people accomplish as much as Bob did during his lifetime, which ended far too soon. I often wonder what new challenges, adventures, and industries Bob would have created if he were still with us. Though he is gone, his legacy lives on at Genentech and throughout the biotech industry, and the industry he founded with Herb continues to change people's lives for the better in ways that Bob so clearly imagined at the outset.

Arthur D. Levinson, Ph.D.
Chairman and Chief Executive Officer
Genentech, Inc.

South San Francisco, California
September 25, 2001

INTRODUCTION by Kenneth P. Morse

Bob touched many of us in his early years, during high school and at MIT. We each had our own unique relationship with him. No single person can speak fully on behalf of all the communities of his youth. By sharing our appreciation for Bob's life through this oral history and other recognitions, we can enlighten others about the many aspects of Bob's human values, personality, and the reasons for his success, which we encountered and enjoyed.

I am fortunate to have known Bob since the fall of 1965 when he entered MIT as a freshman and joined the MIT chapter of the Sigma Chi Fraternity where we lived together. We were together regularly every year since then, especially as our families expanded and grew close. We shared the excitement and frustrations leading up to the creation and success of Genentech. Bob's own words describing how he started up Genentech (later in this oral history) should be required reading at every university teaching entrepreneurship.

Bob's personality in his formative years foreshadowed many of the fine traits which marked his adult life--his sense of humor, loyalty, shy humility, curiosity, commitment to ambitious goals, and his belief in the importance of being "lucky." As fraternity brothers during his five special years at MIT, many of us were lucky enough to share good times and know him well.

Bob's small family moved to Florida from Brooklyn when he was four. Soon thereafter--or at least by the time he was a junior in high school--his parents and grandmother decided Bob was smart enough to go to MIT. When we wonder how to produce successful children, it helps to consider some of the family values in the Swanson home as Bob was growing up:

Team Sports: Bob played Little League baseball in grade and high school, coached by his dad, "Swannie."

TV: Bob was permitted only one hour of TV a week--usually Disney or Wild Kingdom.

Helping Others: Bob was encouraged to tutor kids in chemistry and math.

Early Networking: As a junior, Bob was urged by his parents to write to MIT and to Miami-area MIT alumni so his name would be remembered and appear on the recruiting mailing lists by the fall of his senior year.

High Expectations: High parental expectations were not limited to sports and academics: when Bob returned to the car after seeing his prom date to her door, his Dad prompted, "So Bob, did you give her a smooch?"

Sense of Self: When Bob boarded the Eastern Airlines flight bound for MIT, he had a fine felt hat in the overhead bin. He may have been the only entering freshman in the class of 1969 to be so well equipped. I believe his dad wanted to do everything possible to prepare Bob for MIT, for his career, and for the Boston winters.

Bob's clothes trunk was stenciled with his full name, "Robert A. Swanson." Bob's parents sent their only child off to school with a clear sense of his identity. After college, that special trunk served for years as his coffee table until finally it was replaced by Judy's more refined taste.

Bob's quiet confidence was already immediately evident and very appealing in the fall of 1965 when he walked in the door of the Sigma Chi Fraternity house at 532 Beacon Street. He was humble too, often saying that he would never have gotten through MIT without important academic tutoring from his "Sigma Chi frat lodge brothers." Bob's humility made it easy for the upper classmen to want to help him with tough problem sets and exam preparation.

Giving Back: Even in his early college years, Bob already believed that everyone should "give back" to the community that supported their survival and fostered their success. Bob was famous for giving the most--and the best--tours of MIT during freshman orientation week.

Values and Brotherhood: The Sigma Chi Fraternity at MIT was not only studious but also advocated that the brothers should have "a high sense of honor and a deep sense of personal responsibility." All the brothers were taught Christian ethics, values, and social networking skills.

In those days, the fraternity brothers had a vintage 1920's fire engine and would motor out to Wellesley College to serenade "The Sweetheart of Sigma Chi." Bob--who was almost tone deaf--was forbidden to sing. He stood graciously in the back of the choir, silently mouthing the words. He saved his contribution to later in the evening, after the brothers were invited inside for cider and socializing.

As fraternity house social chairman, Bob had a simple admonition to each freshman: "You gotta show up at the party. You gotta get a date--or I'll get one for you!"

Role Models: The nurturing and demanding environment of Sigma Chi at MIT produced distinguished alumni who served as role models by joining

their much younger "brothers" for dinner, sharing their wisdom and vision. They included then-president (and later chairman) of MIT James Killian and Alex d'Arbeloff, the current chairman of MIT, himself a successful entrepreneur. Sigma Chi at MIT also spawned an Episcopal minister and, more recently, several pioneering Internet entrepreneurs.

Transgenerational Bonds: We are all grateful that MIT researcher Tim Berners-Lee (not Al Gore) invented the Internet so we could communicate about Bob's failing health in real time. Here follow a few of the many special e-mails sent by the next generation of Bob's MIT fraternity brothers. I handed these fond messages to Bob just a few weeks after he was diagnosed with the insidious and gloomy glioblastoma:

"I just wanted to write you a short note to introduce myself and wish you a quick and healthy recovery from your current condition. I know it must be tough, but you'll pull through. Don't ever give up!

Even though we've never met, I know you have a wonderful wife, two daughters, and many friends, that love and care for you deeply. You have been successful throughout your career and your generosity has touched many, many people (including me) whom you have never met.

Lastly, I'd like you to know you will be in my prayers. I'm sure you'll be over this soon, and hopefully we'll meet face-to-face at a reunion in Boston. I very much look forward to seeing you then...

In hoc signo vinces,
Jason Black '98"

"Brother Bob,

We heard of your recent surgery from brother Ken Morse. We are all pulling for you and better still, praying for you. While we have never met, I do feel that I know you. You are an inspiration to many of us since we all know the role you played in founding Genentech, the first large biotech company in the world. It gave many of us the confidence to go out into the real world and leave our marks. It also gave us the hope that anything is possible.

We know it must be tough now, but "fight the good fight" and we hope to see you at the next reunion!

In hoc,
Samuel Choi, Class of 1993"

During the fourteen months after Bob was diagnosed, his fraternity brothers tracked details about his situation and shared admiration for his humor and humility. Many of the best e-mail admirers had not met Bob in person, but knew him by the plaque acknowledging his contribution to house repairs. Hundreds of MIT men have reflected on Bob's special spirit of generosity ever since.

Then, December 6, 1999, the fraternity members received the last in the series of these messages. It started with the subject line: "We have lost our Brother."

Looking back, I believe Bob lived the life he wanted, built on his early values. The ties that bound us and his other close friends together for thirty-plus years, were forged of personal loyalty, adherence to shared goals, desire for mutual support, and commitment to fun and friendship. These ties were elastic, expanding to embrace spouses and children, and stretching across the country. These qualities of caring, friendship, brotherhood, and striving for excellence arrived with Bob at MIT, were amplified at the Institute and at Sigma Chi, and then continued to lead him to the successful life and values which we celebrate in this oral history.

Special MIT Program: At the end of the 1960's, when the Vietnam war and the specter of the draft cast their dark shadows across the MIT campus, Bob aced the draft exam but decided that staying in school for a fifth year would be more valuable than joining the army. He persuaded the MIT administration to permit a special five-year dual degree program in chemistry and management. One piece of Bob's plan was to take business courses with particular relevance to technology. I learned about Bob's intentions through a reference-check phone call from an entrepreneur-turned-professor who created the new enterprises course at MIT in 1961 and was mentor to many--none as worthy as Bob. The reference check went something like this: "Ken, my course is oversubscribed by highly qualified graduate students. Should I bend the rules to admit Bob?" I replied without hesitation, "Dad, Bob's my Brother. I know he will take your course seriously and will make you proud." What an understatement that turned out to be!

Bob never let us down. Bob always honored Dick Morse as his mentor and always gave other eager kids his time. Both our daughters' careers in life science were founded on term papers suggested by "Dr. Bob."

Travels with Bob: Many of us have special memories of traveling with the Swansons--usually involving the best culinary delights in elegant places. I'd like to mention some particularly special travel adventures:

Before China opened up, Bob and I found ourselves talking our way out of a speeding ticket earned while racing from the Ming Tombs to a

dinner honoring Genentech at the Great Hall of the People.

Sailing out of Marseilles harbor on a self-crewed Quatorze Juillet charter, we found ourselves in the middle of a yacht club of nudists--in all shapes and ages.

Touring the fall colors of Vermont with Judy and 3-year-old Katie, Bob and I hunted quail and pheasants with our special pal, Yaichi Ayukawa, also an MIT graduate.

Celebrating German reunification with a visit to the castle "Sans Souci," we clandestinely photographed the parquet floor pattern so it could be copied for the Swansons' pool house.

Through this history of Bob's life, from his early upbringing to his later triumphs--as we take off our hats to Bob--I believe we should, each in our own way, remember that his highest expectations were for himself. He achieved more, loved more, and was more loved, in fifty-two years than most of us can ever hope for. In that sense, we should try not to have regrets, but rather to rejoice and give thanks for the life of our brother, friend, and mentor, Bob Swanson.

Kenneth P. Morse
Managing Director
MIT Entrepreneurship Center

Cambridge, Massachusetts
September 24, 2001

INTERVIEW HISTORY--Robert A. Swanson

Robert A. Swanson at the time of his premature death in December 1999 was already an icon of the biotechnology industry. He was known widely as the co-founder and former CEO and chairman of Genentech, an innovative and far-sighted businessman, and the manager, mover, and motivator of a pioneering company which served as model for a new industry. This oral history takes Swanson off the pedestal, as he records in every-day conversation his vision for and the challenges and early achievements of the "gene-splicing" company which he and molecular biologist Herbert W. Boyer founded in 1976. For perspectives on Swanson's personality, beyond what Swanson reveals in the oral history, the reader might turn to oral histories in this series with close colleagues. David Goeddel, Thomas Kiley, and others reflect on Swanson's egalitarianism, motivational genius, and occasional outbursts of raucous fun. His devotion to his wife Judy and their two daughters, although not alluded to in this volume, is well known to those close to him.

It would of course be impossible to document the history of the biotech industry without including Genentech, the pioneer of an industry yet in the making when the company was formed in 1976 by Swanson, the venture capitalist from the firm of Kleiner & Perkins, and Herbert Boyer, the molecular biology professor from UCSF. Likewise, it would be impossible to write the history of Genentech without mention of Swanson. For the first two years, the man and the company were virtually one and the same. Of course, Herbert Boyer was in the wings having his substantial say. But it was Swanson who was center stage developing the company on a day-to-day basis. Even after the first few years had transpired and the company seemed to have a promising future, Swanson--"Bob" as he was universally known within the company--was the hands-on, walking-the-halls executive who questioned, pestered, inspired early workers, such as wunderkind David Goeddel, into peak performance. In some cases, the results were spectacular. Press announcements of gene clonings and expression of human proteins flowed for a time as though on cue--somatostatin in 1977, insulin in 1978, growth hormone in 1979. By the early 1980s, Genentech scientists were publishing in scientific journals at such a rate that formerly skeptical academics were not only taking note but reorganizing their research programs in order to compete. Both Swanson and Boyer were adamant about giving the scientists full credit for these successes. Nonetheless, institutional support organized by Swanson and the business and legal experts he hired and the company's "Clone or Die" philosophy played a part in the triumphs.

This oral history provides a detailed picture of Swanson's plans for the start-up company, his recruitment practice, and his research and

business strategies. For most, the challenges would have been daunting. Swanson had to raise capital, attract scientists proficient in the new genetic technologies, sell R&D contracts to pharmaceutical companies dubious about the commercial viability of recombinant DNA, maneuver an uncharted course through intellectual property protection in biotech, and so on. While Swanson held science as fundamental to the corporate enterprise, his ultimate goal was to build a successful company--a FIPCO (Fully Integrated Pharmaceutical Company). To do that, he had to learn to understand, appreciate, and incorporate (literally) both science and scientists. In his primary focus on business, Swanson was a good foil for Boyer who as a UCSF science professor understandably felt more at home in making decisions regarding science. The oral histories of the two co-founders can be taken as loose elaborations of the intersecting circles that Swanson and Boyer loved to draw to illustrate the interrelationship of science and business at Genentech.

Another aspect of Swanson's strategy was from the start to aim at producing pharmaceuticals, not merely to sell research and development contracts. This approach targeted at producing a marketable product is clear in Genentech's very first project. As Swanson and Boyer chronicle in their respective oral histories, Swanson wanted to launch the initial industrial application of recombinant DNA by going straight for human insulin, for which there was a potentially enormous market. He was with some difficulty overruled by his scientists who insisted that the hormone somatostatin was a more appropriate target upon which to test whether bacteria could be genetically programmed to produce human proteins to be sold as pharmaceuticals. Swanson carries the reader through the ebb and flow of this initial project as he saw the company's fortune--and his own--fall and rise along with the science. The team's announcement of the successful expression of somatostatin in 1977 indicated the promise of the new approach to drug production and encouraged others to found or join companies based on biotechnology. It also was a landmark in the accelerating commercialization of the biological sciences premised on the new technological capabilities of molecular biology.

The Oral History Process

Five interviews were conducted in 1997 in Mr. Swanson's office at K&E Management in San Mateo, California, a few miles south of Genentech and within easy reach of the high technology companies with which his new venture capital company conducted business. He greeted me affably and after preliminaries entered easily into the rhythm of the interviews. His assistant had already assembled biographical material and all but two of Genentech's annual reports. After the first interview, Mr. Swanson suggested that I obtain copies of early business plans for use in the

interviews. So before our next session, I visited the office of the Chief Financial Officer and obtained them. Also at Mr. Swanson's suggestion, I researched company newsletters in Genentech's Corporate Communications division. I am grateful to the Genentech staff who assisted my research. The plan is that these and other Genentech documents will over the years be deposited in the Bancroft Library, forming the nucleus of an archival collection on the biotech industry and a valuable accompaniment to the oral histories.

Mr. Swanson gave every sign of enjoying the interviews but after five sessions called a stop. The pressure of establishing his new business, interspersed with frequent trips to Boston, were his reasons for halting his story ten years or so into Genentech's history. After that date, the reader should turn to other interviews in this series which carry the history closer to the present. The transcribed interviews were sent to Mr. Swanson in October 1997 for review and approval. By the time he started to review, he had been diagnosed with a brain tumor. Nonetheless, he persevered between radiation and chemotherapy, managing to review about forty pages before his illness made it impossible to continue. With Judy Swanson's approval, Thomas Kiley, former general counsel of Genentech and an early colleague of Swanson, offered in 2001 to speed the project along by adding Swanson's changes and finishing the editing. Footnotes added by Mr. Kiley are identified in the text as his. I am very grateful for his help. Mrs. Swanson received the edited transcripts and invited Kenneth Morse and Arthur Levinson to write introductions. I thank them all and wish particularly to acknowledge Kathy Zvanovec-Higbee for shepherding this project to completion.

The Regional Oral History Office was established in 1954 to augment through tape-recorded memoirs the Library's materials on the history of California and the West. Copies of all interviews are available for research use in The Bancroft Library and in the UCLA Department of Special Collections. The office is under the direction of Richard Cándida Smith, Director, and the administrative direction of Charles B. Faulhaber, James D. Hart Director of The Bancroft Library, University of California, Berkeley. The catalogues of the Regional Oral History Office and many online oral histories can be accessed at <http://library.berkeley.edu/BANC/ROHO>. Online information about the Program in the History of the Biological Sciences and Biotechnology can be accessed at <http://library.berkeley.edu/BANC/Biotech/>.

Sally Smith Hughes, Ph.D.
Historian of Science

Regional Oral History Office
The Bancroft Library
October 2001

Robert Arthur Swanson

Born November 29, 1947, Brooklyn, New York

Education

Alfred P. Sloan School of Management, MIT, Master of Science in Management, 1970
Massachusetts Institute of Technology, Bachelor of Science in Chemistry, 1970

Corporate Experience

Citicorp Venture Capital, 1970-1974
Kleiner Perkins Caufield & Byers, 1975-1976
Genentech, Inc.
 Co-founder, President & CEO, 1976-1990
 Chairman of the Board of Directors, 1990-1996
K&E Management, Ltd., Founder, Chairman & CEO, 1996-1999

Selected Awards

Entrepreneur of the Year, Recipient 1981
 (Awarded by the Research Directors' Association of Chicago)
Entrepreneur of the Year, Recipient 1983
 (Awarded by Stanford Business School Alumni Association, Peninsula Chapter)
Distinguished Entrepreneur of the Year, Recipient 1993
 (Awarded by Babson College)
Exemplary Leadership in Management Award, Recipient 1997
 (Anderson School of Business)
National Medal of Technology, Recipient 1999
Biotechnology Heritage Medal, Recipient 2000
 (Posthumously Awarded by the Biotechnology Industry Organization and the Chemical Heritage
 Foundation)
Royal Swedish Academy of Engineering Sciences, Appointed Member

Board Affiliations

AGY Therapeutics, Chairman of the Board of Directors
Chemdex Corporation, Member of the Board of Directors
Fox Venture Partners (Formerly Flag Venture Partners), Advisory Board Member
Genentech Foundation for Biomedical Sciences
Geron Corporation, Member of the Board of Directors
Harvard University Faculty of Medicine, Member of Board of Fellows
Memorial Sloan-Kettering, Member of Board of Directors
MIT Entrepreneurship Center, Founding Board Member
Molten Metals Technology, Member of Board of Directors
San Francisco Ballet, Member of the Board of Trustees

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Board Affiliations (continued)

San Francisco Museum of Modern Art, Member of the Board of Trustees
San Jose Tech Center/Technology Center of Silicon Valley, Member of the Board of Directors
Techno-Venture Co. Ltd., Member of the Board of Directors
The Nueva School, Member of the Board of Trustees
Tularik Inc., Chairman and Member of Board of Directors

Other

Panel on Advanced Technology Competition, National Academy of Sciences (1982)
Advisory Committee to the Director, National Institutes of Health (1985)

Memberships

American Association for the Advancement of Science, Member
American Chemical Society, Member
American Society of Microbiology, Member
Chief Executives' Organization, Member
MIT Club of Northern California, Member
World Presidents' Organization, Member
Young Presidents' Organization, Member

INTERVIEW WITH ROBERT SWANSON

I CHILDHOOD, EDUCATION, AND EARLY CAREER

[Interview 1: October 28, 1996] ##¹

Family

Hughes: Mr. Swanson, let's start with where you were born and educated.

Swanson: I was born in Brooklyn, New York, and I grew up in Miami Springs, Florida. My father worked for Eastern Airlines, and they moved their headquarters to Miami in 1950 when I was three. I grew up in a small town near the airport, and my dad [Arthur J. Swanson] was an airplane electrical maintenance crew leader. He worked shifts. We both loved baseball, and he always spent time coaching Little League. It was a nice environment to grow up in.

Both my parents had been to a year or two of college. My father had gone a couple of years to Pratt [Institute] at night, and my mother [Arline Baker Swanson] had an aunt that financed one year at Skidmore. It was everyone's goal that I would be the first in the family to complete college.

Hughes: Were you an only child?

Swanson: Yes.

Hughes: So from early days, you were headed for more, in their eyes?

Swanson: Right. Our family had a philosophy that each generation would do better than the last.

¹## This symbol indicates that a tape or tape segment has begun or ended. A guide to the tapes follows the transcript.

Education

Undergraduate, Massachusetts Institute of Technology, 1965-1970

Swanson: I was interested in science, and we all hoped that I would get into MIT [Massachusetts Institute of Technology], which was my first choice. Luckily, I was accepted [1965]. I was planning to be a chemist and in fact wound up getting an undergraduate degree in chemistry. At the end of my junior year, I interviewed for and got a summer job working for a chemical company, Hercules in Wilmington, Delaware. I enjoyed the work in the Materials Science Division of their research center, which was really the first time I had worked in a laboratory. It was a great learning experience and I discovered a lot about myself. One of the things I discovered was that I enjoyed people more than things. So I said, "Gee, this probably isn't going to be what I'd want to do all my life," although I did enjoy that summer.

I came back to MIT for my senior year, and that year they had made optional the thesis requirement for a chemistry degree. So what I wound up doing was petitioning MIT to start the first year's courses at the [Alfred P.] Sloan School of Management at MIT for a master's degree, and they agreed. I wound up getting both degrees at the end of five years. It was the time of the Vietnam War and that extra year at MIT meant not having to go to Vietnam. Technically, I was in the class of '69 at MIT, but I actually got both degrees a year later in 1970.

Alfred P. Sloan School of Management, MIT

Hughes: What prompted you to think of business as an addendum to your chemistry?

Swanson: I don't remember exactly what it was. But I did know I wanted to work with people. I thought, well, okay, business is dealing more with people, and why don't I give it a try? I believe most of us follow a zig zag path to wind up where we are.

At one point when I was doing chemistry, I thought I might want to be a doctor. One of my fraternity brothers, C. J. Davis, who's now a world-class emergency medicine doctor, would drag me off to the emergency rooms. I remember being in Boston City Hospital after midnight one week. It seemed pretty impersonal, lots of slap 'em together, sew 'em up, and get 'em out. This was

a little tough for me. So I thought maybe I wasn't cut out to be a doctor. It was probably too tough a test. In retrospect, I cycle back to the fact that I started a company that develops drugs. I don't know exactly where these tendencies come from, but I did wind up sneaking in the back door of the health-care business.

Hughes: What did the curriculum at Sloan provide? I assume that there were some ties with what you were going to do some years later at Genentech.

Swanson: Being an undergraduate at MIT obviously provided a lot of exposure to science and engineering and a familiarity with chemistry. I learned not to be afraid of science or very complex problems. Probably the two most important things that came out of those early years were one, tackle things one at a time and two, how to manage your time. At MIT more than any other place there was much more to do than you could ever get done, and it often involved deciding which subject wouldn't get studied that week, and there were only four courses per semester! So it was more challenging to an undergraduate than many other places. Actually, one of the things I'm proudest of is that I started with a B, two C's, and a D. I had the highest D, but it was still a letter of the alphabet I had never seen before on a grade slip. But I did wind up with all A's, so I was very proud. It was a battle, but I managed to win. I even won the chemistry award my senior year.

Hughes: Some of your success was because of learning how to prioritize?

Swanson: Part of it was that and just getting in the flow. I had gone to a big public high school [Hialeah High School]; we had 1,100 kids in our graduating class. It was a good education, with honors programs and such, but MIT was still a big jump. So part of it was that. The other thing was not to be afraid of science, that you could dig in and understand it. And it also got translated later into saying, well, if you're an interested, intelligent person, people that are experts in a field should be able to explain something to you so you can understand it. And if they can't, then they don't understand it themselves.

So I used that very much in business, because even though I had only a bachelor's degree in chemistry and really had no molecular biology or anything of that kind, I would expect people to be able to explain the science to me in a way that I could understand. Obviously, the technical aspects were much more complex and the doing of it was more difficult, but the basics of all these things have to be understandable. So those two things were important.

As I got into business school, there were two things that excited me. One was the idea of developing new products and how an idea got generated and finally turned into something tangible that people bought. I was studying marketing and new product development. The other area that was the most interesting and helpful to me was organizational development. It was the whole process of how do you build teams of people to achieve things, climb mountains, whatever it is that needs to be done? Those were my main interests of business school.

Hughes: Were those regular parts of the curriculum, or did that involve some choice on your part?

Swanson: Everyone got a taste of all the disciplines--marketing, finance, and so on. But as I went on to the second year, marketing and organizational development became my focus.

And then things changed when I took one course, which was called Introduction to New Enterprises. It was taught by a fellow named Dick Morse, who was to become a mentor. He along with Bing Crosby had started Minute Maid orange juice. Morse was an entrepreneur who was not a professor, but at that time he was the center of entrepreneurship at the Sloan School, and he taught this one course. It was limited to sixteen people once a year, half from Harvard Business School and half from the Sloan. The course focused on how companies get started, how they get financed with venture capital, and how to put together your own business plans. During the course we met with local venture capitalists, learned about that business, and studied the development of a rapidly growing local company. We picked Thermoelectron, which George Hatspoulos had started. At the end of the course, in teams of four people, we had to put together our own business plans.

Hughes: Was this an unusual assignment?

Swanson: I think it was very unusual at the time. It's now become very popular. Stanford and Babson [College] and many other places have entrepreneur courses. But at the time, Dick Morse was definitely leading the way.

On my last trip to Boston the end of last week I visited the MIT entrepreneurial center. Ken Morse, who was my a fraternity brother and Dick Morse's son, is now in charge of the entrepreneurial center. I gave the speech kicking off their \$50K competition. The idea is to get scientists and business people together to create business plans and award \$50,000 to the winning team. It was nice to see it go full circle. Ken was one of the founders of 3COM. His office is in almost the exact location as his father's.

Early Career

Citicorp Venture Capital, Ltd., 1970-1974

Swanson: I said, "Well, this course on entrepreneurship is really wonderful. Here you've got ideas going to products at the same time you're building a company." So I asked Dick Morse, "Well, how do I get involved in this venture capitalist stuff? This is really exciting." He said there was a fellow named Phil Smith who had just been given the job at Citibank to build a venture capital group. He was hiring young, newly minted MBAs [master's degree in business administration]. Among lots of interviews about product marketing--Procter & Gamble and Minnesota Mining and others--I went down to New York City, and he hired me.

There were probably eight of us who were all pretty fresh out of business school. We were given \$100 million to invest with Phil's guidance, and everybody learned a lot. The scientists at Genentech later jokingly called it my postdoctoral training. [laughter] But you know, it was a great overview of others' mistakes and successes. We actually made quite a bit of money for the bank.

Hughes: Now, was that an unusual tack for a business to take, to give neophytes a pot of money to learn with?

Swanson: It was very unusual, yes. Bank of America had a couple of people that were doing that as well. Wells Fargo also had a few.

The government at that time had allowed banks a brief period of time to set up SBICs [Small Business Investment Companies]. The timing was fortunate, and a small number of us got an incredible opportunity to enter the venture capital industry. It was actually the lowest job offer I received, but it was the job where I could learn the most.

Hughes: And that's what appealed to you?

Swanson: Yes, I wanted to learn as much as I could about this area. Well, banks don't pay anything, right? [laughter]

Hughes: What about contacts that you made at that stage? Did any of those prove to be useful later on?

Swanson: Not of a major kind.

Venture Capital

Swanson: I started work at Citicorp Venture Capital in 1970, training and learning and building my confidence. In 1973 I was chosen as one of two people to come out to California to set up our West Coast office. About a third of the money was invested in California.

Hughes: Why was that?

Swanson: Well, it's interesting how venture capital developed. For many years it was centered around Boston and San Francisco. There are other pockets that now have developed. The earliest venture firms included Draper, Gaither & Anderson out here, and American Research & Development back East, and just a few others. You had financing available for companies and successful entrepreneurs that somehow got started. Then that process continued. Dave Packard was on my board for ten years helping me, and now I'm on other people's boards. Also, there was the motivation, Well, I'm as good as my boss is. Why don't I start something on my own? And there was the money and infrastructure available to do it.

California, specifically San Francisco, and Boston were the two centers. Philadelphia only recently is getting started. It has good universities, wealthy individuals, but none of that infrastructure. It probably all started with a number of the wealthy families, the Rockefellers and the Whitneys. They recycled their wealth into new companies in new areas.

The Rockefeller family invested not only in the oil business, but they were one of the founding investors in Eastern Airlines, which is another recycle. Captain Eddie Rickenbacker, World War I flying ace, started an airlines, and he was backed by the Rockefellers. They also started McDonnell-Douglas. They put up risk money to back new industries. The same is true for the Whitney family and others. That history has now become more institutionalized, but these families continue to be regular quality suppliers of capital. In fact, the Rockefeller family was the original backers of Thermoelectron, and as part of my Sloan School learning, I went down to meet the people who had made the decision to invest in it.

Hughes: Is venture capitalism in California focused on Silicon Valley, or is it more diverse than that?

Swanson: I don't know how I'd do it in percentages, but in California, the vast majority was always here in the San Francisco Bay Area, with a sprinkling in Los Angeles, and now with biotechnology, in San Diego.

Hughes: I mean before biotech. Is that what you mean?

Swanson: Yes, even before biotech. If you look at the Bay Area versus Los Angeles, San Diego, you probably had 60 percent of the activity here--these are very rough estimates--maybe 30 percent in Los Angeles and 10 percent in San Diego. Biotech has maybe brought that up a little bit, but it's in the ballpark.

Hughes: The concentration of venture capital in this area is because of Silicon Valley?

Swanson: I'm not the best one to give you the history, but Stanford had a policy of allowing people to own the rights to the research they developed and to spin them out. Hewlett Packard was really the beginning of it, and then the spinout of other companies. L.A. had a lot of aerospace developments and other things, so there was some activity down there. But the electronics piece of it really was here, in part due to the university's policy. It was very similar to the UC system where they have a policy to encourage funding of research at the university. In fact, the agreement that I set up with the UC Board of Regents in starting Genentech was that we funded all the costs of the research, including supplies and overhead, and in return got rights to any patents that would come out, for the life of the patent. So those kinds of interactions have been very strong in the Bay Area, and I think that's why this has become a center of the biotechnology industry.

Hughes: You came to California in--

Swanson: I had been with the bank from '70 on. I came to California in 1973. Then Phil Smith, my New York boss who had come out of the Far East, said, "That is where all the activity and opportunities are, and we'd like to promote you to go to Hong Kong." I said, "That's great, but I'm not really a banker. I really enjoy starting up companies."

Hughes: Why did that appeal to you?

Swanson: Well, as you go through life, you learn more about yourself, and I've discovered that I'm happiest when I'm building something. I've never been good at building things with my hands, but I get excited about the whole idea of creating something where there wasn't anything before and having it be something good. Even now, what gets me most excited is working with an entrepreneur who's going to change the world, and he says, "Well, gee, how should I think about..." And so I can be a sounding board for his ideas. That's a lot of fun.

Banking in Hong Kong would have been a good career choice if you wanted to be a banker, but it wasn't for me. If that opportunity [to found Genentech] hadn't come, I probably would have continued doing what I was doing for a while.

Hughes: Risk isn't a consideration? Many people would have chosen the Hong Kong offer because it led to a secure position with chances of advancement. You took a risky course, at least in comparison. Is that valid?

Swanson: Yes, I would guess so. One of the things that had a big impact on my decision was, I had been working at Citibank maybe a year or two, and one day they fired 200 vice presidents. They were all in the transaction part of the business, where there were two billion checks coming over the wall every day, and they hadn't geared up the computer systems to deal with them. Admittedly, they hadn't done a good job, but a lot of these employees had been there twenty years. So I said to myself, Well, gee, this isn't the way to build loyalty in an organization. Maybe there's early retirement; there are better ways to take care of people. Obviously you've got to do something about solving the business problem, but you've got to take care of people after that.

So it dawned on me that you think about a bank as a secure business environment, but really there's no security unless you're producing more than you're taking home. If you're doing that, then you have security wherever you are. Sometimes that's easier to say than it is to do. The decision about Hong Kong was easy for me; I was single, had nobody to take care of but myself, so there was just no question; I wasn't going to Hong Kong.

I just had a chance to use that example with one of my entrepreneurs whom I've been working with. He's going through a difficult patch. He was saying, "Well, I have to lay off people." I said, "Try your best to avoid that. Obviously, the company has got to continue to survive. If you can deal with the issues by moving people from one project to the other, or raising performance standards and saying, 'Gee, okay, you were a good performer; now you need to do this well or you can't stay,' it's much better for the company, because you lose an incredible loyalty otherwise. You've made some mistakes, or the world has changed, or things are always difficult, but then somehow the little guys at the bottom suffer for it. And that's not good."

Partner, Kleiner & Perkins Venture Capital, 1975

Swanson: One of the lucky things that happened--it didn't seem lucky at the time, but I've always been a very lucky person--was most of the people on the West Coast had made an investment in a company called Antex, and it went south very quickly. The company was making light-emitting diodes and went into bankruptcy very shortly after the initial investment was made. Two people worked to try and get some money out of it, and one was myself and the other was Eugene Kleiner of Kleiner & Perkins, which has now become Kleiner, Perkins, Caufield & Byers and is probably one of the best known venture capital firms.

With that, I got to know Eugene Kleiner, and so when the opportunity to go to Hong Kong came and I wasn't going to take that, I went to talk to him about the potential of joining their firm. As fortune would have it, they had two partners, Jim Treybig and Jack Loustaunau, who were spinning off in 1974 to start a company called Tandem Computers, which became a very well-known and substantial computer company. So there was an opportunity for me to join Kleiner & Perkins, with the idea that at some point I might be able to do the same thing. So this was very interesting and exciting, because I was beginning to have self-confidence in my decisions and judgments about business issues--

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Swanson: --to try starting a company on my own. Some of the Sloan School students have asked, "How did you know you were ready to do this?" I said, "You know, it's a very frustrating thing, because no one can tell you when you are ready." I remember before I was married, I would ask people who were married, "Well, how do you know this is the right person?" And it always came back, "Well, you just know." [laughter] And you say, "Gee, that isn't a very satisfactory answer." It was the same kind of thing: when do you know you're ready to try it on your own? The answer becomes, well, you just know.

Hughes: And you did.

Swanson: At the end of 1975, after I had been working with Kleiner & Perkins a year, I became ready to try and do something like this.

Hughes: Was there an event that encouraged you to take off on your own?

Swanson: When Treybig and Lousteneau spun off, they actually had to raise a good part of their money themselves before Kleiner & Perkins put any money in, and eventually they did. A very similar thing

happened to me, because at the end of '75, Kleiner and Perkins said--and this is the triggering event--"Gee, we'd like to have just the two of us working here." Which meant that at the end of '75, I wouldn't have a job. So talk about environmental factors that give you motivation! [laughter]

Hughes: They were senior, so they could make that decision?

Swanson: Right. Their names were on the door, Kleiner & Perkins, and clearly I was very much the junior partner, as were Treybig and Loustaneau. They said, "You can continue to have a desk and a telephone until you find what you're going to do." But there is nothing like that to give you motivation.

Hughes: Why do you think they came to that decision?

Swanson: I don't know. At the time, I thought, Well, maybe I'm not very good. It made me think, Maybe I'm being fired. What eventually I've come to understand, because they did make the investment in Genentech, was that there was something going on between the two of them, and they wanted to work it out on their own. About a year afterwards, they figured that really they needed some more people, and they finally hired [Frank] Caufield and [Brook] Byers, and then they started growing.

Job Hunting, 1975

Swanson: So what triggered this was, I needed to get a job. I was interviewing a lot of people, from large companies like Intel, where I could get some operating experience before I went out and started on my own, to lots of smaller companies. I probably had three interviews a day for three or four months. This was a pretty scary period.

Hughes: Yes, I can imagine. Was there any particular sector that you were concentrating on?

Swanson: No. I probably was more technology-oriented.

Hughes: Because of your background, or had that become an interest of yours?

Swanson: Well, why is technology interesting? It allows you to have a unique competitive advantage over somebody else. There are other advantages you can have. But this is one area in which, if you come up with something unique, you patent it and you move

quickly, you have a chance to be very competitive. So it lends itself to building companies.

II GENENTECH, INC.

Attempts to Create Interest in Recombinant DNA Technology

Cetus Rejects Swanson and Recombinant DNA Technology

Swanson: During the year [1975] that I was at Kleiner & Perkins, there was a U.S. government law passed that became known as the Prudent Man Law. I believe it said that pension and certain other funds couldn't invest in private companies, or it somehow made it much more difficult for institutional money to be invested privately. I don't remember the full details.

Well, Cetus had been formed by that time by Don Glaser and Ron Cape and Pete Farley. They had an automated system for screening microorganisms so that if you were looking for one that produced more of an antibiotic, they'd put their whole mechanized system to the task of doing that. They had an automated system for what people had been doing by hand.

We got a call at Kleiner & Perkins saying that one of their institutional investors had to sell. So Eugene Kleiner and Tom Perkins and I went out to Cetus to look at it. Ron Cape showed us all the screening technology, and at the end of that day we said, "Well, this seems like a reasonable thing." So we bought the shares from the institutional investor and became an investor in Cetus.

Hughes: It was in Emeryville [California]?

Swanson: Yes.

So that had happened at the end of 1975. Moshe Alafi, who was the chairman of the board of Cetus, was an old friend of Eugene Kleiner. So as I was going through the question, what am

I going to do?, one of the things I got interested in was this technology. Cetus at that time was saying, "Look, we're doing this microbial screening system now, but this recombinant technology is coming along and is going to be wonderful stuff. You're going to be able to make insulin and other hormones."

Hughes: Cetus wasn't yet using recombinant DNA technology, right?

Swanson: Right, they weren't.

Hughes: Why, if they thought it was so wonderful?

Swanson: I'm going to tell you; I'm going to tell you. [laughter] So with the introduction from Eugene to his friend the chairman, I went over to see Ron Cape, and we had an interview, and I said, "It seems this new technology that you talked about is going to be really exciting, and I'd like you to hire me to do it." It had germinated for a while, and I said, "God, this feels like important stuff."

Hughes: Had you done any reading?

Swanson: I read a number of papers. I was doing a lot of interviewing for jobs those days too. [laughs] The question was, What am I going to do? And I looked at everything from joining Intel to a Stanford professor had a way of concentrating radioactive waste.

I guess Cetus thought about it and they said, "No, we're not going to hire you. We think this technology is going to be wonderful, but it's not going to happen for a long time. It wouldn't be fair to hire you and wait for it to happen."

Hughes: Did they give you any reasons why they thought it was a long time off?

Swanson: None that I really remember or that made any sense. Now, you never know, maybe they were being polite but thought, Well, you're a jerk; we don't want you. [laughs]

Hughes: Cetus didn't use recombinant DNA technology for a while.

Swanson: They didn't do it for a long while.

Approaching Scientists

Swanson: So this possibility [of commercial application of recombinant DNA] started germinating while I was having all these other

interviews and trying to figure out what I was going to do. I said to myself, This is really an important event, and wouldn't it be wonderful if you could really use microorganisms to make these products? And why is it that it can't be done today? So I started calling people cold on the telephone, and you read in the speech that I called Boyer.¹ But I called to a lot of people. I went down to Syntex to their new business development group and said, "What do you think about this stuff?" And Syntex replied, "It's great, but it's not going to happen for a while." They were not working in the area. I talked to other professors, and I don't even remember who.

Hughes: You were calling these people blind?

Swanson: Yes, I just picked up the phone.

Hughes: Can you generalize about how people responded?

Swanson: Well, some people didn't want to talk, but most people were happy to talk.

Hughes: Did most people know about the technology?

Swanson: Well, the people I was calling were people whose names were on [published] papers.

Hughes: You made several contacts before Boyer?

Swanson: Yes, I think so.

Hughes: Boyer told me that he thought you had an alphabetical list which he believed you had derived from the people associated with Asilomar [Conference on Recombinant DNA Molecules, February 1975.]² He concluded that you must have talked to Paul Berg, and that he [Boyer] was probably number two on the list.

Swanson: I don't remember. But Boyer was near the beginning.

Hughes: Was it an alphabetical list?

¹[Robert Swanson], "Stanford Speech," Acceptance of Entrepreneurial Company of the Year Award, Stanford Business School, 1983. (Copy of draft courtesy of Robert Swanson.) See Appendix D.

²See: Herbert W. Boyer, "Recombinant DNA Science and Its Commercialization at Genentech," an oral history conducted in 1994 by Sally Smith Hughes, Ph.D., Regional Oral History Office, The Bancroft Library, University of California, Berkeley, 2001.

Swanson: No, I don't think it was. But the fact that he was close, and some of these guys were far away, was important.

I went to a couple of conferences, and I don't remember which ones. I remember going to an MIT conference and being very impressed with Phil Sharp and wanting to get him involved, but I don't know what the timing of that was. He gave one of the lectures there and I said, "This guy is really good."

Hughes: You mean you're not sure if this was before you founded Genentech?

Swanson: I don't remember.

Hughes: You were flying around the country?

Swanson: No, I was mostly using the phone. It was almost all local. I think that this MIT conference was later. It was after Boyer.

Hughes: How did you get the names? Were you reading scientific articles?

Swanson: I got some papers, and I was looking at the names at the end of them, as the leaders. I started locally. I'm sure the MIT conference was later, now that you mention it. It was Stanford, UCSF, and I think I may have made some calls to L.A. or Santa Barbara. Somebody was doing yeast work in Santa Barbara. Was it Donald Helinski? I don't remember who was there, and I don't even know if I did call. But it was local, and Boyer was one of the first, and he was close. So what happened is that when I finally got a chance to talk to Boyer, and we were very compatible, some of the names later on my list never did get called.

Hughes: Do you remember if you talked at that early stage with Stan Cohen?

Swanson: Well, he was an advisor to Cetus, and I don't think I talked to him. I'm not sure. I don't think I did.

Foundation and First Years of Genentech

First Meeting with Herbert Boyer, January 17, 1976

Hughes: You give in one of your papers a precise date for your first meeting with Boyer, namely, January 17, 1976. Why does that precise date stick in your mind?

Swanson: I don't know. It was a great meeting. It was so incredibly lucky to find Boyer and have Boyer be the person that he was.

Hughes: How was he over the phone when you first called?

Swanson: He was very polite and nice. He said he was busy. I said, "I really need and want to talk to you. I think that this technology could be commercialized." He said, "Well, I think probably." A lot of the people I had talked with weren't at all thinking that it could be done. He finally said, "Well, come by on Friday afternoon; I can spare you ten minutes." And then I did that.

Hughes: So he was interested, at least in a peripheral way? This wasn't a way of politely dismissing you--give old Bob ten minutes and that will take care of him?

Swanson: He wouldn't have let me in the door if he wasn't interested a little bit. In looking back, he said, "Here I had the U.S. government funding my research for so many years in this area, letting me follow my nose in what I like to do. Commercial application would be an opportunity to give something back and see the real benefits come of this research." I think that's part of what drove him in those days.

Targeting Insulin as a Product

Swanson: We talked about the ideas, and Herb got enthusiastic, and I did too. I asked myself, How do we decide what product we make? There was a woman, Margaret Dayoff, who had written a book on protein structure. It was just coming out. Herb said, "Gee, we're going to probably need the protein structure in order to produce proteins." So I went through her book, trying to see what proteins were known in terms of their of structure that would be interesting economically to make. The obvious one that popped to the top of the list was human insulin.

Hughes: Why?

Swanson: It had a large existing market. Diabetics were getting pig or cow insulin that was extracted from the pancreas glands of cattle and pigs that were slaughtered. I put together some lists of criteria in terms of products to go after, and one of the things you didn't want was to have a missionary marketing problem. Once you had succeeded in overcoming the technical hurdles, it should be pretty obvious that recombinant human insulin would be better than pig or cow insulin.

Hughes: You didn't want to have to go out and create a market.

Swanson: Right. There were too many other risks involved. Bill Hambrecht of Hambrecht & Quist, a local investment bank, has said the only common characteristic he has noticed in the successful entrepreneurs he's invested in has been that they're all basically conservative. This is an interesting comment, because they're willing to go for it, but everyone is looking at how you minimize the risks as you're doing so. How do you cover the downside? Stuff is going to happen, I know; how do I make sure that I can protect myself when it does happen? And so looking for what product to develop, I thought, Okay, how do I pick something that minimizes the risks?

The first business plan has some of this.¹ We asked, could you do it economically? Herb and I said, "Which protein does *E. coli* make the most of and what percentage of the cell weight is it?" So we looked at that; I don't remember what he came up with. But we said, "Well, look, it wouldn't be unreasonable if the *E. coli* produced 5 percent of its total protein weight in a particular protein." So then we ran some rough numbers of how much it would cost you to grow it up at laboratory scale.

Then Herb said, "Okay, so this is your basic raw material cost if you succeed. Now, what are companies in the insulin market doing now? They're getting pancreas glands." So I called the American Meat Institute and said, "Okay, what do pancreas glands sell for?" He said they were a dollar-fifty or dollar-seventy-five a pound. And then Eli Lilly had in their annual report that it took 8000 pounds of pancreas gland to produce a pound of insulin, and they put the gland in one of these big presses and squeezed it.

And so we looked at this. We said, "You know, we're close. We ought to be able to do it for less, but at least we're in the ballpark." And we believed people would rather have human insulin than pig insulin. So we said, "Okay. As best we can tell today, there's a big need." Lilly was selling \$400 million worth of insulin a year. It's a small molecule; it was probably somewhat technically feasible based on what we knew. The economics looked pretty good. If we did it, it could be patentable. I don't know; we probably had a list of other criteria that we looked at in trying to decide.

Hughes: You created the list, or you created it jointly?

Swanson: I did it.

¹[Robert Swanson], "Meeting, Stanford Office of Technology Licensing," April 19, 1976. (Chief Financial Officer files, Genentech, South San Francisco, California.)

Choosing to Synthesize DNA in vitro

Hughes: It was oriented towards the business feasibility of this project, right?

Swanson: Right. And then I would come back to Herb and we'd talk about the scientific feasibility. And his brilliant call in those days was that Axel Ullrich and Howard Goodman and everybody were working on cDNA [complementary DNA] technology, but it wasn't working yet. Nobody had really done any cDNA cloning. They had bits and pieces. Herb said, well, he had just collaborated with Arthur Riggs and Keiichi Itakura at City of Hope Medical Center [Duarte, California], and Herb said, "Well, this insulin molecule is small enough; these guys are synthesizing DNA."

When I met Herb in January 1976, he showed me a paper--it was a preprint--where he and Riggs and Itakura had collaborated to show that synthetic DNA was read--the bacteria couldn't tell the difference between chemically synthesized DNA and DNA.¹ So the synthetic DNA was just a segment put in there, and I think it was just replicated like everything else. It was a segment of the *lac* operon or something like that; I don't remember the paper exactly.

In my way of thinking, it was the last piece of the puzzle you needed to have in place before you could begin tackling the next problem, which was, Can you get a microorganism to make a human hormone or not? And so Boyer correctly said, "Well, let's go with the technology we know works [in vitro DNA synthesis]." We could have gone for the cDNA, but its technology was under development, and maybe it develops three months, maybe it's six months. But you didn't know, though we still were keeping track of that. We said, "But we can chemically synthesize these genes." Then we devised a whole strategy of building and combining the overlapping DNA strands that make them up.

Hughes: Now, to bring in the larger context, the recombinant DNA controversy was happening at this time. RAC, the NIH Recombinant DNA Advisory Committee, established safety guidelines for recombinant DNA research but they didn't cover synthetic DNA. Was it in your thinking, we can do this chemical procedure without having to worry about the NIH guidelines?

¹H.L. Heyneker, J. Shine, H.M. Goodman, H.W. Boyer, J. Rosenberg, R.E. Dickerson, S.A. Narang, K. Itakura, S. Lin, A.D. Riggs, "Lac operator DNA is functional in vivo," *Nature* 263, no. 5580 (1976): 748-52.

Swanson: Most of the decision--99-plus percent--was based on the technical aspects. You say, "Okay, depending on how some of these things work out, at least we're probably safer than other people by using this synthetic DNA approach because we know exactly what we're making." At that time, there was risk in cDNA cloning of getting something in there they didn't know about. So it wasn't related so much to the guidelines. Rather, it was the argument well, you're chemically synthesizing this little DNA segment, and it has to then get linked to this overlapping segment. So when you're finished with this, you know pretty much exactly what you've got. So the decision was related principally to that aspect.

So I went to the library and I generated all these different ideas.

Hughes: Your major responsibility in this partnership was to weigh the feasibility of the economics, and Boyer was handling the science?

Swanson: I went to the science library to dig up all the potential ideas, and then I'd come back and we'd talk about which was feasible. But you very quickly got to human insulin, right? There were not a lot of other choices. There were other things that might be interesting, but insulin is fifty-two amino acids, small enough that you could practicably synthesize it.

The chemical synthesis of the DNA was the judgment call that Herb made, correctly in terms of the technical side. The whole plan--let's do human insulin, let's do the analysis of how we do it, and the spreadsheets in terms of how many dollars, how many people, and other things--is what I did.

On April 7 of '76, we each put in our \$500 and incorporated Genentech.

Hughes: Because you thought insulin was doable? As simple as that?

Swanson: Yes.

Committing to the Foundation of Genentech

Hughes: You thought a company might have a chance of actually making this product?

Swanson: Well, I'm glad you stopped me. During this same period, I was still doing a lot of interviewing. I was running around and interviewing because I needed to get a job. Finally I said to

myself, Should I do this or not? The answer is--and I often recommend to other people to use this as a tool for making decisions because it incorporates all the logic as well as all the emotion--look at yourself as an old man or woman, say, eighty-five. Looking back over your past life, what would you want to have accomplished? And for me, the approach integrated everything and it said, "Look, I think this is important. If I don't do this, I'm not going to like myself so much for not having given it a shot." So that was what made that decision.

Hughes: That's rather remarkable at age--twenty-eight?

Swanson: Yes, I was born November 29, '47.

Hughes: What about Herb? Why did he decide to do this? He had a secure position at the university.

Swanson: He's always said he wanted to give something back, and I think that's part of what it was. I think he wanted to see some of the science he was doing be of value. I don't think he ever thought about making money. I don't know, maybe he did.

Hughes: Did you?

Swanson: Well, mostly building a company. I wanted a job. [laughs] But it was mostly building a company and doing something important. We had a conversation about who would own what. I said, "Look, Herb--

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Swanson: --we're a team. That's what it's going to take to build this company. And yes, Herb was critical for getting the scientists; he was absolutely critical for the technical decisions. He said, "Well, now, one of the things we have to do right away is see Riggs and Itakura; get them involved." But he was still teaching. He was still doing his own research [at UCSF]. I was really driving the research [at Genentech] as well as the business part of it, in terms of, Okay, what has to happen? And with the scientists telling me what needed to happen, then I would make it happen. With Herb's brain, I was the driver on the research as well. When we finally had the agreements set up at City of Hope and Caltech, I would go down there and I'd bring the material up. [laughs] [tape interruption]

Maybe I should go back and look at the financial side. Well, during these early months of '76, I had gone back to Eugene and Tom and said, "Why don't you continue paying me a salary? I'm going to put this thing together." And they said, "No." So I was a little unhappy with that. In retrospect, it was the

right thing to do, which was to say, "All right, you're a young kid. Are you really serious about this, or is this just a completely academic exercise because you're looking for something to do?" As a result of that, during '76 I wound up being on unemployment. I got \$410 a month tax free. My half of an apartment in Pacific Heights was \$250. My lease payment on the Datsun 240Z was \$110, and the rest was peanut butter sandwiches and an occasional movie, plus I had a little savings, not very much at that time.

Financing

Hughes: Had you been talking in some detail with Kleiner and Perkins about this venture?

Swanson: Well, I told them I was going to do this.

Hughes: But not the ins and outs?

Swanson: Not the details.

Hughes: So you weren't going back to them as mentors and getting advice?

Swanson: No, they had let me go.

I don't remember the exact timing, but I went out and started raising monies from others. I had raised a good bit of what we needed when Kleiner and Perkins said, "Well, it looks like you're really serious about this, Bob. Why don't you come in and make a presentation?" So Herb and I came in--it may have been May of that year [1976], I don't know, but I think we had our money by June. I know it was about six months that I was without a job. [laughs]

Hughes: Now, Kleiner and Perkins were hooked by the fact that you had already raised X number of dollars?

Swanson: Well, that I had a bunch of people interested. Herb and I came in and presented our business plan.

The First Business Plan, Spring 1976

Hughes: Did you have a business plan before you approached people other than Kleiner and Perkins? Did the plan come first?

Swanson: Oh, yes, a business plan had to be put together first.

Hughes: Can you re-create the presentation to Kleiner and Perkins?

Swanson: It was a simple business plan.¹ It talked a little bit about the technology, and I remember I had some pictures of DNA and the different coding sequences, and a little bit about being able to synthesize DNA, and then what our goal was, which was human insulin, and a little bit about why the basic economics of the manufacturing process would work. And then how we'd accomplish the task, in terms of, we're going to need so many people and these kinds of reagents and resources in order to do it. So it was a pretty early-stage thing.

Hughes: What did Herb say?

Swanson: Well, Herb talked about the science. He basically said, "I think we can do this [make insulin]."

Hughes: How was Herb at translating complex science for laypeople?

Swanson: Oh, he's very good. It turned out that we're very similar in a lot of ways about our beliefs.

One of the things Herb always said was, "Well, we've got to give the junior guys the credit. They're doing all the work. Don't put my name on this insulin paper." I had found the money, and he had said, "This is what we ought to do," but insisted, "I don't want to be on the paper. Here are the guys who did the work; they should get the credit." And I had very much the same philosophy from the business side, which is, you've got to hire very capable people and give them the opportunity to do their thing, and give them the credit for what they're doing. So there were lots of things in those early days where Herb let me go and do it, and with his guidance on the science, I just drove it.

Hughes: You had the business picture in mind, but you also had the drive? I mean, you knew what had to be done to get where you wanted?

Swanson: I was the one that was in a hurry. And I was putting together schedules on how things would need to be done.

¹[Robert Swanson], "Genentech: Outline for Discussion, Kleiner & Perkins, April 1, 1976." (Chief Financial Officer files, Genentech.) See Appendix B.

Obtaining Research Agreements

Swanson: That first year, our main goal was to get Riggs and Itakura on board and get contracts with the University of California Board of Regents and with Caltech. It turned out that Itakura had a joint appointment with City of Hope and Caltech, so I had to do a deal with Caltech as well as with City of Hope Medical Center.¹ It didn't make sense to me that we should fund, build, put money into facilities for Genentech because nobody knew yet if the science was going to work. Let's fund research at the universities and get the rights to the patents. Everybody said, "This [recombinant DNA technology] is going to be wonderful," but nothing had happened yet. There wasn't any microorganism around spitting out a human hormone or anything like that. So we said, "Well, let's make sure that it will work before we invest in our own facility. And of course, this was the perfect kind of research for a university because it was proving something new.

Incorporation, April 7, 1976

Hughes: Were you calling yourself Genentech yet?

Swanson: Yes, because we had to have a name when we incorporated. I said, "We're going to incorporate, Herb. We've got to have a name." The "Herbob" idea that I had was terrible [laughter], and Herb came up with, "Why don't we call it Genentech?"

Hughes: The incorporation was--

Swanson: April 7, 1976.

Hughes: What had happened by that time?

Swanson: Well, at this point I had said, "Okay, this is what I'm going to do." I had eliminated all the other possibilities, and I felt comfortable: Okay, I'm going to go for this. We had incorporated, and then I was out trying to raise money to get us going.

¹The interviewer located a "Sponsored Research Agreement, effective this first day of October, 1976, by and between Genentech, Inc., and California Institute of Technology," (Chief Financial Officer files, Genentech) but was unable to find an agreement with the City of Hope.

Collaborating with Arthur Riggs and Keiichi Itakura

- Hughes: And Itakura and Riggs were going to cooperate?
- Swanson: Herb has a better memory about this. But sometime in that period we went down to see Riggs and Itakura to see whether they would be part of this.
- Hughes: Their participation wasn't a precondition for founding Genentech?
- Swanson: I don't know when it happened. It probably happened before April 1976.
- Hughes: Because otherwise, you wouldn't have known that the synthetic DNA approach was possible?
- Swanson: We knew that it was possible because of the paper Herb had already collaborated with them on, the *lac* operon paper.
- Hughes: But if you didn't get them to collaborate, were you prepared to do it on your own, without Itakura and Riggs?
- Swanson: Sometime in that time period, we went to visit them, and they said they were interested.
- Hughes: But the way you're telling it, it doesn't sound as though their collaboration was a precondition for Genentech: "We've got to get Itakura and Riggs if we're going to make this company go."
- Swanson: No, it was basically Herb in his way saying, "Gee, I've worked with them; they provide a part of this." Did we meet with them in March or May? I don't know. We wouldn't have gotten very far without having them on board. Both of us flew down there and said, "Hey, this is what we're thinking about doing. Are you guys interested?" And of course they were because they had just proposed to the NIH that they try and get a microorganism to produce the hormone somatostatin. They had been turned down on their grant proposal because they said they would do it over a three-year period, and the response was, "You're being too aggressive. It's not possible to do that."
- Hughes: Riggs and Itakura didn't hesitate to work with a company? As you well know, in academic biology, a link with industry was certainly not as common as it is nowadays, to put it mildly.

Swanson: Oh, well, hardly anybody would do it. Riggs and Itakura had made their NIH proposal, and they had been turned down. Here we wanted to do a very similar thing, and they said, "Here's free money." I think they were enthusiastic about the project, and they were heading in the same direction. The big risks were not there. The big risk was the one that [Herbert] Heyneker took in leaving the academic world to be a full-time employee of Genentech. All the rest was, I'm accepting some industrial money; will my peers criticize me?

Hughes: Do you remember discussions of that kind with Itakura and Riggs?

Swanson: I don't remember. I'm not the best at a lot of those details. It was always an issue.

Seeking Scientific Consultants

Swanson: Somewhere there are signed consulting agreements from Rutter and Goodman where they agreed to consult with us and got compensation in stock, and then backed out because they couldn't stand the peer pressure against being affiliated with an industrial company.¹

Hughes: Where did those agreements come in the chronology?

Swanson: Probably during that year of '76. May have been '77.

Hughes: The reason you wanted Rutter and Goodman as scientific advisors was because they were working on insulin?

Swanson: Well, of the group of people that understood what was going on [in cloning research] at that point in time, these were the leaders. I wanted to get the best advice we could.

Hughes: They cloned the rat insulin gene in 1977.²

¹The interviewer located agreements with Genentech, signed by Howard Goodman and Axel Ullrich; no such agreement with William Rutter was located. (Swanson to Goodman, April 1, 1977, Hormone Research Institute, UCSF; Swanson to Ullrich, April 1, 1977, Chief Financial Officer files, Genentech.)

²For details of this achievement and the role of the UCSF Department of Biochemistry in early recombinant DNA research and politics, see: William J. Rutter, "The Department of Biochemistry and the Molecular Approach to Biomedicine at the University of California, San Francisco," volume 1, interviews conducted in 1992 by Sally Smith Hughes, Ph.D.,

Swanson: Right.

Hughes: So everybody was still working on rat insulin?

Swanson: I don't know where they stood.

Okay, there was this competitive technology, cDNA cloning technology. So I wanted to make sure that if it progressed, I had access to that technology and to the leaders. And Goodman and Rutter and Ullrich and [Peter] Seeburg were on the forefront of that.

Hughes: So you were thinking, let's also get this other technology.

Swanson: Yes. Let's make sure we have people that really understand this so that we know exactly where it stands.

I need to go back a little bit, because what happened is, Riggs and Itakura convinced us that the first thing we should do was somatostatin. They said, "Look, it's just going to be too technically difficult to do insulin to start with. Let's make somatostatin. It's smaller; we can do that one, and then based on that demonstration, we'll have proven the technology. And then we can go to the next level, and we'll have perfected everything." I fought that like the devil because I always hated the idea of doing a demonstration of anything. If you're going to go for something, go for the real thing. But finally, Herb and Art convinced me, and so we took that approach. So that was the discussion in '76.

More on Obtaining Research Agreements

Swanson: At the same time, I was flying around setting up these agreements. The first money was \$100,000 from Kleiner & Perkins, which bought 25 percent of the company at the time and lasted us nine months. So that came in June, I think. The rest of '76, I was setting up these research agreements with the City of Hope and UC and Caltech, which took most of the year to do. UC was in one sense easier because it prescribed exactly how it would go: you [the company] fund all the cost of the research and overhead, and you get the patent rights for the life of the patent, but you have to negotiate a royalty. Also, UC was the easiest in the

sense that the research agreement guidelines were set out. But some of the individuals were complicated to deal with, between the central licensing office in Berkeley and UCSF.

Hughes: But they did have a mechanism in place?

Swanson: There was a mechanism in place, but this was the first time anything like this had come up. And then City of Hope has no endowment. It started out as a Jewish center for tuberculosis at Duarte in the Pasadena area. They now take care of patients and do research, but with no endowment. Every single dollar has to be raised every year, and they do an unbelievable job of raising this money. Every chair in the cafeteria has someone's name on it. It's such a difficult task, so there was a real need for funding there. So about this agreement, everybody said, "Well, this is money that I wouldn't have otherwise." [laughs]

It turned out we did the agreement with Caltech, but eventually they didn't really make any of the inventions, so there was no royalty stream to them.

Hughes: Was it easy to make an agreement with Caltech?

Swanson: Yes, Caltech was probably the easiest because they were used to having research agreements with industry.

The Second Wave of Financing, February 1977

Swanson: So that whole process took place primarily during the remainder of '76 while the research plans were put together and Riggs and Itakura convinced us to do somatostatin. Then, based on all the agreements in place and the plan ready to go, I raised the next round of money in February 1977, I guess, which was about \$850,000. Then the research on somatostatin began in about February of '77.

Hughes: Kleiner & Perkins funded the first phase. Who was involved in this February step?

Swanson: They put in another \$100,000.

Hughes: What motivated them?

Swanson: Making more money.

Hughes: [laughs] Yes, but why with you? It was an untried technology and, from what you've said, they must have had some doubts about you.

Swanson: Well, see, everything I said I was going to do, I did.

Hughes: As simple as that.

Swanson: I had said I'd set up the agreements; we'd be all ready to do the research. So all that had taken place exactly as planned. Kleiner & Perkins put in just \$100,000 of the \$850,000 to get the other venture capitalists to come in.

Hughes: Is that a usual ploy?

Swanson: It changed. But at that point in time, you'd make an early investment, and then you'd make some others, but the goal was to get other people to put more money in later on. And there were some very good funds, the Mayfield Fund and others, that came in at that time. And that was the money that was going to prove the technology with somatostatin, which happened the following August or September [1977]. It was seven months from February when we started the work that culminated in the proof of the technology.

Research and Social Associations at UCSF

Hughes: You still hadn't hired anybody?

Swanson: The funding was for the [academic] research labs, so nobody had to leave the university. Rather than coming from NIH, the funds came from Genentech, and they were able to do the research they wanted to do.

Hughes: Some funding was going to Herb Boyer's lab, to two of his postdocs?

Swanson: Yes. The funding went to Heyneker and Paco Bolivar to do the research and for the reagents and a part of Herb's time and whatever UC's overhead was at the time, 39 or 40 percent or something like that.

Hughes: Which caused trouble within the university, within the Department of Biochemistry.¹

¹See the previously cited ROHO oral histories with Herbert Boyer and William Rutter, and the oral history in process with Keith Yamamoto.

Swanson: I don't remember. I wouldn't be the best one to know.

I remember during the work on somatostatin, so it was during '77 or even before then, I would go over to UCSF. I think it was usually Goodman's lab that would have what became the ho-ho's at Genentech. They'd have wine and cheese on Friday, and everyone would get together and talk. It was a very congenial atmosphere. I borrowed that idea not only from them but from Tandem, which would have beer gatherings on Friday. It was a chance for people at all levels of the company to get together and talk and share ideas.

Hughes: You felt part of the UCSF group?

Swanson: I think they accepted me. I think Howard was a little, what's this guy doing here? But they knew that Herb vouched for me.

Hughes: How did you dress to go over to the university?

Swanson: I usually had a suit on. [laughter]

Hughes: Right there, you stuck out like a sore thumb!

Swanson: Yes! But not all the time.

Hughes: Well, you could have felt quite socially isolated: it was a group of scientists who knew each other before you appeared on the scene, and their attitude could have been, here is this guy from industry. Why is he here?

Swanson: I got along really well with all of them; it was very congenial. I love talking science; I was really interested in what they were doing. For me, it was an exciting, stimulating thing. Where does this thing go, and how fast is it progressing? So just to listen to them was fun.

Controversy over Faculty-Industry Associations

Hughes: One question being asked at the time was, What right do university scientists have to be making money from government-funded basic research?

Swanson: I don't remember all the details, but for me it came down to, why do we want the government to take part of our tax dollars that you and I send in every year and fund basic research at the university, especially in the biological sciences? We hope that there are going to be some basic discoveries that come out of

there that eventually can be turned into products that can cure Aunt Sally's cancer or Grandma's arthritis or whatever it is. We love to have science progress but basically we want some tangible results. And whose job is it to deliver that? It's industry's job to deliver on new products.

One of the strengths of the United States, and it hadn't been in the molecular biology field, has been the quick transfer of technology from academe to industry. We do it better than anywhere else in the world, and it's why we're so successful.

The discussion that I remember was, is this industry-funded research appropriate for a university environment, or are you just using the university to make products? Well, we weren't doing that, so that wasn't it. The other one was, if you're funding research in the lab of somebody who owns the company, are some of the people in the lab getting the benefit? Well, that's all right if it's all disclosed and everybody knows what the deal is. And it was all disclosed. Everybody knew everything that was going on, so that wasn't an issue.

One of the things that was important to me was that every scientist working on this project was also a shareholder. So all the early postdocs bought shares with their own money. Since Herb and I put in \$500 each--and we had no money--we figured that everybody would be able to put in \$500 if they wanted. If they bought more shares than that, we'd lend them the money, but everybody had to write a check for \$500. If they bought \$2,000 worth of stock, or \$5,000, they'd get a loan for the difference. So they all had a chance to buy shares.

Hughes: And did they?

Swanson: They did. Because I believe--and this has continued to today--people doing the work should be owners of the business. Even if you own only a small part, you think like an owner and you make the best decisions because you spend the company's money like you'd spend your own. Also, if you build value in the company that's beyond what you take home in a salary, which is what you should be doing, then you get to participate in that income.

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Swanson: It wasn't until we got Itakura doing it, and the lab set up at City of Hope, that the synthetic DNA really started coming out.

Hughes: Dr. Boyer spoke to me about his painful memories of that period. He felt attacked by some of his colleagues.

Swanson: Oh, I think he was viciously attacked.

Hughes: So you knew that was going on.

Swanson: I knew that people were unhappy. I think later it developed more. I don't know exactly when the time period was, but there was criticism of him--"selling out to industry" was the terminology. You can imagine the pressure when Goodman and Rutter signed consulting agreements and then felt so much pressure that their academic colleagues would think so much less of them that they couldn't go through with those agreements. So Boyer was pretty unusual in the sense he said, "I think this is the right thing to do, and I'll take the criticism of my peers because I'm going to do it." On the other hand, he was committed to Genentech at that point.

As someone has said, they had people on the inside of the Nobel committee when they made a decision, and the fact that Herb had commercial ties was one of the reasons he didn't make the last cut. And I believe that's true. I think he and Cohen did the breakthrough experiments.

Dan Adams and International Nickel

Swanson: Let me add just one comment: one of the second-round investors was a company called International Nickel. A fellow named Dan Adams there had been excited about this technology, and he was in charge of getting them into new areas of science.

Hughes: Had he heard of recombinant DNA from you?

Swanson: I don't remember. One of the reasons we wanted him as an investor is, he had talked to a bunch of scientists in Europe and elsewhere, including Charles Weissmann and Walter Gilbert and Phil Sharp at MIT, and a number of others in Europe. Dan said, "Well, if I invest in you, I will bring these people along and they can be advisors." What actually turned out is that he made the investment. And then he set up Biogen, took our business plan, and funded these scientists in starting Biogen who were supposed to be advisors to us.

Genentech actually wound up getting some shares, because I was angry and went over to a Biogen meeting in Slough, right near Heathrow Airport. Finally they said, "Oh, yes, Genentech should

get a few shares for this," and then we immediately sold them back to them. It was very little money.¹

Presentation to Crocker Capital, March 12, 1976

[Interview 2: November 20, 1996] ##

Hughes: Since we talked last time, I found some more early Genentech documents, and so I'd like to go over the beginnings of the company in a bit more detail. Please tell me about the presentation that you made to Charles Crocker.²

Swanson: Before the original investment was made by Kleiner and Perkins, they said, "You have to show us that you're willing to do this on your own." So I went out to try and raise money from individuals and other institutions, and one of those early presentations was to Charlie Crocker, a longstanding venture capitalist on the West Coast. And there were a number of others, too.

As it turned out, a good part of the money was raised prior to Kleiner and Perkins committing the first \$100,000 to the venture, and they committed it based on their being the only investor. So some of the people I talked to early, unfortunately, didn't get a chance to participate. Charlie Crocker did decide to pass, so he wasn't one that had decided to participate. And remember, it was just me and an idea at that point, so it would be very unusual if somebody got very excited about it.

Arguing for an Exclusive License for Recombinant DNA Technology

Hughes: In April 1976, you made an appearance at the Stanford Technology Licensing Office.³ At that point they were trying to get a patent on the Cohen-Boyer work that had happened in 1973-1974, which was the basis for what you were doing.

¹\$300,000, as reported in the Offering Prospectus for Genentech's initial public offering. (Notation by Thomas D. Kiley, hereafter cited as TDK.)

²[Robert Swanson], "Outline for Discussion, Crocker Capital, March 12, 1976." (Chief Financial Officer files, Genentech.)

³[Robert Swanson], "Genentech, Meeting, Stanford Office of Technology Licensing, April 19, 1976." (Chief Financial Officer files, Genentech.)

Swanson: Right.

Hughes: Could you tell me about that meeting?

Swanson: Yes. We had a number of meetings over that period of time, and Niels Reimers was there.¹ I tried to convince him that he should give Genentech an exclusive license to the Cohen-Boyer work for making pharmaceutical products. I felt that was the best way to ensure that the universities maximize their return because it would give somebody an enormous incentive to really develop the technology. They opted instead to offer a very broad, inexpensive, nonexclusive license, and they've done very well with that. The experiment was never done whether they would have made more if it had been exclusive, but it was probably not politically possible.

That presentation was to try to get an exclusive license because I saw those early Boyer-Cohen patents as important and precursors to the ones that we achieved by being the first to actually produce a human hormone [somatostatin] in a microorganism. So the combination of those two inventions would have been very strong patent protection for the company.

Hughes: Who was responsible for the decision not to give Genentech an exclusive license?

Swanson: It was Niels. He was in charge of the Cohen-Boyer patent application. We later licensed the technology nonexclusively, and he thought that approach was the best way to maximize the return for the university.

Hughes: Were universities in the habit of granting exclusive licenses?

Swanson: Oh, sure.

Hughes: So you weren't asking anything untoward?

Swanson: No. And in fact, if a company funds research at UC and it covers all the costs including the overhead, the university will give you an exclusive license for the life of the patents or any patents that come out of that work. Of course, you pay UC a royalty, and that's to be negotiated. I think there's a strong history of that happening. The University of Florida had Gatorade, I guess was the invention, and they licensed that

¹See: Niels Reimers, "Stanford's Office of Technology Licensing and the Cohen-Boyer Cloning Patent," an oral history conducted in 1997 by Sally Smith Hughes, Ph.D., Regional Oral History Office, The Bancroft Library, University of California, Berkeley, 1998.

exclusively to one company and reaped good returns. So it's basically an economic decision.

An exclusive license provides a real incentive for the person that has it to get out and make that technology as available as he can. Because you know yourself, if you had a choice to invest in two companies, and one had a nonexclusive license to a wonderful invention and one had exclusivity, you'd rather invest in the latter because the chances of success would be greater.

Hughes: Yes, but couldn't one also argue that with a technology that had as many potential applications as recombinant DNA, the more companies having a license the better? There was no way that Genentech could explore all the avenues available. So in terms of getting the technology dispersed, didn't it make sense for Stanford to have a nonexclusive license?

Swanson: Well, sure. At one point they were exploring having some semi-exclusive licenses.

Hughes: How would they work?

Swanson: You can talk to Niels about it, but I think it was limiting the license to five companies or something, so there would be competition. We discussed a whole range of options. At the time and still today, everybody's looking at industrial applications, agricultural applications, and I was just interested in making pharmaceutical products. So I said, "Okay," and we discussed, well, if an exclusive license is not possible, how about an exclusive on a couple of polypeptides. So I think you could have divided it lots of different ways. One could say that it would have taken a lot more work and maybe would not have been practical, but if you did exclusive licenses product by product for a higher royalty, Stanford and UC probably would have done better.

Hughes: Yes.

Swanson: At some point, we licensed companies in Europe. We finally said, "We can't do a license in every country; it just takes too much time." So we then looked for a partner that could take care of all of Europe. So there are real constraints on what can be done.

Hughes: Did it worry you when you walked away from that meeting at Stanford that you did not have an exclusive license?

Swanson: No, because it was pretty clear that someone else wasn't going to get it if we weren't, and that Niels would make a decision to

make it broadly available. Remember, at that time nobody else believed [recombinant DNA] could work. We hadn't even proven that you could make a useful product out of it. So he saw the potential and I saw the potential, but there weren't a bunch of other companies clamoring to invest money in this field.

[laughter]

Hughes: That's what companies coming into the field after Genentech had to face. Genentech was up and running, and these patents weren't exclusive: do we have a prayer of a chance of competing? You had a clear field that after you no other company had.

Swanson: Right. Well, luckily, there's so much to do that even in the broad pharmaceutical industry, which was our field--and this may have changed recently--no one owns more than 5 percent market share, except possibly Merck. So you compete along very specific lines. If you have an insulin product, you might have one competitor in that business. Or if you're making a beta blocker, then you may have three or four competitors. So really there's lots of opportunity for competition in the industry. And obviously we couldn't do everything.

Focus on Making a Few Products

Swanson: In fact, we purposely focused on doing only a few things well. When we strayed from that, Dave Packard would remind us at the board meetings, "Boys, I haven't seen too many companies die of starvation, but quite a few get indigestion." And he would put us back on track. It was very, very nice to have a mentor like Dave to help guide us because here was somebody that had done it before, had built a multi-billion-dollar company [Hewlett-Packard], and done it in a way where people were still excited to go to work there. There was a good, strong culture and taking-care-of-people philosophy in the company even years and years later. We modeled our corporate philosophy--it's different, but the basics of my development of the corporate philosophy really came out of HP's statement of objectives, I think they called it, that I saw and I liked very much. So Dave was a great help all along the way.

Hughes: Is Packard's advice reflected in this second business plan?¹ Because I notice there is some language about concentrating on

¹"Genentech, Inc., A Developmental Stage Company, Financial Statements, Period from Inception 4/7/76 to 12/31/76, Report of Certified Public Accountants." (Chief Financial Officer files, Genentech.)

specific products, in other words, not spreading your energy too broadly. Would Packard have been on the board by 1976?

Swanson: No, it wouldn't have been that early. It would have been in the late seventies, early eighties.¹ [tape interruption]

Hughes: We've been looking through the documents, trying to find a statement indicating that Genentech--before Mr. Packard was on the board, which was some time after 1980--was already very focused. You might want to comment on why you saw focus as important for the company.

Swanson: I think one of the things that I did the best in those days was to keep us very focused on making a product.

Somatostatin

Swanson: We're looking at the business plan of December '76. At this point, the arrangements had been made for doing the research with UC and City of Hope and Caltech. We were ready to begin the process of seeing whether we could get *E. coli* to make a human hormone. So this was the money that was raised here, which actually closed in February [1976]--some \$850,000 that we then invested at those different universities to see if we could clone and express the somatostatin gene in *E. coli*, which we succeeded in doing at the end of the summer of 1977, about six months after we had officially started Genentech and way ahead of anybody's expectations that it could be done.

One of the scariest parts for me was when we had succeeded in synthesizing different segments of the gene, hooking it up to the promoter sequence, and putting it into *E. coli*. We were down in Art Riggs's lab at City of Hope looking for somatostatin [whispering dramatically] and nothing came out. So this was chewing on my heart, and I think I actually got physically ill that day, because I thought, Oh, God, everything that everybody thought might or should happen didn't happen.

It turned out after a month or so of working on this problem that the somatostatin was being made by *E. coli*, but it was being chopped up as quickly as it was being made, so it wasn't easily detectable. We had to come up with a trick of making the

¹On October 21, 1981, Genentech issued a press statement announcing Packard's election to its board of directors. (Corporate Communications files, Genentech.)

somatostatin attached to a longer protein, and then chopping it off, and then we succeeded. But it was a very scary time, when you saw money and your career and reputation going down the tubes.

Hughes: There was some concern in scientific circles that when you spliced a foreign gene into a bacterium that it might take on the genetic material but it might not express it. You never had doubts about that; Herb never had doubts about that?

Swanson: Well, before we started, they had chemically synthesized the gene for the *lac* operon, and that seemed to work just like a natural *lac* operon. So we believed that if you synthesized the gene for a human hormone and you hooked it up to the right control signals, you could get it. But no one had done it before so no one knew for sure. If you didn't believe that, you wouldn't have started the experiment. [laughs] But it was lucky that it worked as quickly as it did.

Hughes: In the presentation to Stanford, you talk about devoting Genentech's resources to one product area at a time, and that's what struck me about the focus of the company. Another way would have been to hedge your bets and try several things at once. But you didn't see it that way?

Swanson: Well, we were a very tiny company. It was basically Herb and I, and Herb had his duties as a professor at UC, so there was one full-time employee. According to these agreements with the UC Board of Regents and Caltech and City of Hope, we were funding the research, which was research to establish, could we make a human hormone? We started out with the goal of doing insulin, and then based on the scientific input that this might be just a bit too far technically for the first step, we switched over to somatostatin, and that was what was done in '77.

Somatostatin was fourteen amino acids; insulin had fifty-two or fifty-four. So it was the next step up in something to tackle. We thought that if we succeeded with insulin, there would be a significant commercial market opportunity because of people having to take pig and cow insulin extracted from pancreas glands. And since we had to be focused, we concentrated on insulin.

Hughes: Yes, for several reasons, as you're saying. One, manpower; there wasn't much. Then limited finances, and also because of the science itself. I know you had to be convinced, as you said last time, to take on somatostatin first, but scientifically, it made sense to progress from somatostatin to insulin.

Swanson: Right.

Limiting Risk

- Hughes: Another thing you said in the presentation to Stanford was that you would not be engaging in what you call "missionary marketing efforts." You might want to talk about that, and also your longer-term vision of what you wanted this company to become.
- Swanson: If you're really going for it on the science, then you want to limit risks in the other areas. So in the financing area, you don't want to run the chance of running out of money. And you don't want to be taking risks on--if you succeed in getting the product, will anybody want it? And so the missionary marketing statement was really designed to say, "Okay, here's a product that people need today. Hopefully, the human version of insulin will be a better version than the pork." We didn't know that, but it would seem to make sense that the version in the human body would be better accepted and people would want it. And so as a first product, you weren't going after a totally new product that nobody had used before. It was a way of limiting the risks.

Corporate Goals

- Swanson: As I look here at the corporate goals in these presentations, it was always the goal from the beginning to build a major, profitable company. That's number two in this list of goals. The first is, "To engage in the development of unique microorganisms capable of producing products that will significantly better mankind."¹ So we had to be able to show we could make microorganisms capable of producing products that will significantly better mankind. And we were going to be a company to make and sell these products ourselves.

So those were very clear statements from the very beginning. We didn't want to be just a research operation; we had to be able eventually--we couldn't do it at the beginning--to make and sell the products, and we were going to try and build a big company to do this. We were going to advance the state of science, which was important. And then we were going to have the very best people. We were going to have them come, and we were going to try and be a place where the best people would want to work, and they would want to stay. Actually, I'm pretty proud of that, when I look at this business plan. It was very clear right at

¹[Robert Swanson], "Genentech, meeting at Stanford Office of Technology Licensing, April 19, 1976." (Chief Financial Officer files, Genentech.)

the beginning, and I think they were, although ambitious, the goals and objectives we needed to achieve.

Hughes: You wanted a fully integrated company that would develop, market, and perform all the activities of a pharmaceutical house?

Swanson: I think in the long run, you needed to do that in order to control your destiny.

One of the most successful pharmaceutical companies, a company in Europe called Janssen, had been run for many years, doing outstanding science and licensing the products out. Eventually there was not enough money in the licensing to fund the next round of research, and so they finally became part of Johnson & Johnson. So that example, and I don't know when I focused on that, is something I think about now as being key.

The economics are pretty significant. Obviously, if you sell something in the pharmaceutical business, you have costs of marketing and other things, but typically, your margins are in the 85 or 90 percent range. At that time, pushing 8 or 10 percent was thought to be an outrageous royalty rate. One way or the other, you've got enormous research risk. So you start looking at what you're able to achieve in terms of the return on your research investment, and it's a better return if you're able to make it and sell it yourself. If we make a better return, we can plow more into research. So that was part of the thinking as well.

The High Cost of R&D

Hughes: All along, you were driven by the high costs of R&D, which take up more of the budget than in other sorts of business, right?

Swanson: Yes, and we have always been at the upper end. I don't know where the industry average today is, maybe in the high teens or low twenties in terms of research and development as a percentage of revenues. I think around 50 percent of all our revenues get plowed back into R&D, so it's very much higher than the industry average, and it always has been.

Hughes: You mean the biotech industry?

Swanson: No, the pharmaceutical industry.

Hughes: So what would a Merck be putting into R&D?

Swanson: I think maybe 18 percent or something like that. And a food company might be at 0.5 percent. So the pharmaceutical industry itself is at the very high end of the range. But at the beginning, to be fair, it was all R&D [at Genentech]. It was 100 percent, because there were no product sales. [laughter] But it was always the thought that we'd plow back a much greater percentage into R&D.

Hughes: Another thing you said in the presentation to Stanford was that you were going to identify an initial market for a protein product with known chemical structure. Were you thinking of insulin or somatostatin?

Swanson: I don't know whether we had decided. The goal was always from the beginning human insulin. The somatostatin was a step towards that goal. I think I saw human insulin mentioned in the outline for the presentation. [scans documents] Somatostatin is part of the plan that was attached here.

Hughes: You're looking at the documents for the Stanford presentation?

Swanson: I'm looking at the Stanford presentation.¹ So the plan was to build the microorganisms to produce somatostatin first and then insulin.

Hughes: Well, that indicates that you'd already been talking with Riggs and Itakura.

Swanson: Right.

Hughes: And that was April 1976.

Swanson: April 19. So it was shortly after we were incorporated. Yes, I think we probably met them some time in February, March.

Hughes: Yes, before you were incorporated.

FDA Approval

Hughes: Then there is a list of criteria [reading] "to identify an initial market target. 2. A product which is available today only in limited quantities compared with demand, where our production techniques are substantially less costly than those of the current suppliers... 3. A product whose market potential is

¹Ibid.

greater than \$20 million... 4. A product whose market volume is high compared to the capital equipment necessary to produce it. 5. A product with a well defined limited customer base to minimize marketing expenses... A product that minimizes the effects of government regulation." Regarding the last, you were thinking of more than the NIH guidelines?

Swanson: Clearly, from the beginning the goal was to try and find a product that could be reviewed and approved easily by the FDA. At that time, insulin was actually regulated under a different set of rules than new chemical entities, and so I thought that might be helpful. We didn't have a lot of experience, obviously, but we did a little homework to try and figure out what would be the end point for approval.

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Swanson: In the insulin case, it was easy to say, Okay, is it safe? Is it reducing the level of glucose in the blood? As opposed to some of the other FDA criteria which were more difficult to satisfy at the time. At the time, they were requiring survival to prove a new cancer drug, so you had to do long studies and show survivals. Even arthritis: is your hand feeling a little bit better? It's not as easy to measure, and probably would be longer and more difficult for approval. So thinking about how quickly something could go through the regulatory process was a key part of the product selection.

NIH Guidelines for Recombinant DNA Research

Hughes: Industry was not regulated by the NIH guidelines, although I think Genentech voluntarily abided by them.

Swanson: Yes, we did.

Hughes: Why?

Swanson: Well, we thought we were lucky that there were guidelines in the United States, unlike Japan and Holland and a few other countries which prohibited the research. Herb and I had actually worked quite diligently, going back to Washington to suggest that the guidelines be [only] guidelines and then put in place with the flexibility of reducing them or changing them. We were sure they would be reduced, because in our minds there wasn't a concern about safety. It was important if you have that structure [the NIH guidelines] that everybody follow them. We wouldn't have

gotten our first scientist [Herb Heyneker] if Holland hadn't prohibited his doing his work.

Hughes: I didn't realize there was total prohibition, because there were American research teams that went abroad to escape the guidelines, as you probably remember.

Swanson: Right.

Hughes: Isn't that one of the reasons that Biogen--

Swanson: --went over to Strasbourg? Yes.

Hughes: And members of the UCSF Rutter-Goodman team went to France.

When you began to work on insulin, did you have to have P3 [physical containment 3] facilities?

Swanson: No, we were synthesizing the DNA, which is the other advantage of that approach. We knew what we were putting in. In addition, you have to remember that cDNA technology at that point was hardly developed. It was a dream in Axel Ullrich's mind, and it was moving very quickly, but it couldn't be relied on to do what you wanted it to do. So again, you knew you could synthesize these genes. It was complicated and expensive and long, but you knew pretty well that you could put them together like that.

Somatostatin as a Potential Product

Hughes: Did you seriously consider marketing somatostatin? Or was it always just a step to insulin?

Swanson: I think that we thought that it might have some potential. We weren't sure. It was a signal that turned things off, and we said, "Well, maybe this could be a useful product." But the goal was always insulin. Once we had somatostatin available, other people did more in looking at it. I know Merck made a whole bunch of analogues with unnatural amino acids and other things to see if there could be a product there. But we couldn't afford to do that; we had to have something where we knew there was a market.

Hughes: Yes, and somatostatin was questionable, was it not?

Swanson: Yes, you didn't know. Maybe it could have been wonderful. People are still looking at it today. I saw somebody the other

day doing research on it. So there are some other potential applications.

Leaking the Somatostatin Success Story in the U.S. Senate

Hughes: On November 2, 1977, when *Science* received the paper on somatostatin, the head of the National Academy of Sciences, Philip Handler, reported to a Senate committee that somatostatin had been produced.¹ The announcement was meant to indicate yes, recombinant DNA was promising technology, it was doable, and it also had commercial possibilities. Do you remember that?

Swanson: I don't remember. I remember Herb and me making a number of trips back to Washington and sitting in Senator [Edward] Kennedy's office and explaining the technology, and our reason why the guidelines shouldn't be made law but left as guidelines.

Hughes: You were not called to testify to Congress?

Swanson: I don't think so. Boyer might have.

Hughes: Yes, Boyer definitely did, and Rutter did as well.²

Sponsored Research Agreement with the University of California

Hughes: Let's turn to the contract with UC.

Swanson: Oh, the sponsored research agreement, yes.

Hughes: [tape interruption] We're looking at the contract with the University of California, the first of August, 1976.

Swanson: Effective then. I think it was signed a little after that. What it did was describe the research that was going to be conducted in Dr. Boyer's lab and what the results might be, and grant us rights under any patents that would come out of that. In that sense, it followed almost directly from the guidelines that the

¹Stephen S. Hall, *Invisible Frontiers: The Race to Synthesize a Human Gene*, (Redmond, WA: Tempus Books, 1987), pp. 174-175.

²For Boyer's and Rutter's views on their congressional appearance, see their previously cited ROHO oral histories.

Board of Regents had at the time--I think still do, but I'm not certain of that--that were set up to encourage industry to fund research. They said, if you fund all the costs of research plus overhead, you can get rights to the patents for the length of the patent life, for a royalty or some other kind of agreement.

Hughes: It was an exclusive license in this case?

Swanson: Yes. We were funding research. We were very careful to make sure we used no government money, so we had all the direct and indirect costs of the research covered. UC got their overhead rate for funding, and we'd get exclusive licenses on any patentable work that was done in the context of the research. There's a budget approved--

Hughes: An exclusive license was pro forma?

Swanson: Yes, that was part of the regents' patent policy.

Hughes: With the Stanford Technology Licensing Office, apparently a discussion point had been what kind of compensation the university was going to receive, whether it be royalties, or was there indeed talk about stock options?

Swanson: I don't remember. And the contract with UC here talks about royalties not to exceed a certain percent of selling price. I know for sure that there were discussions with Niels Reimers about an equity position there at Stanford. I don't know whether it was ever brought up at UC or not. I'm projecting, but I imagine that we might have talked about that.

As a member of the board of trustees at MIT later on, I've always encouraged the university to take equity. I think the universities would be far better off if they did take equity positions in addition to some royalty. Oftentimes, it's a way of diversifying their risk, because maybe there are no patents on the topic that's funded there, but if the company does well for other reasons, they participate in that. And oftentimes, a company gets valued in anticipation of product sales so that their return can come sooner than a royalty stream. If I was advising a university at that time or today I would encourage them strongly for their own benefit to take some equity.

Hughes: But for whatever reason, Stanford and UC chose not to take equity positions.

Swanson: Well, I think it was the guidelines. The agreement focused on a royalty rate to be negotiated with the regents. So I don't know; I can't guess at what they were thinking.

Hughes: Was the patent office at UC up to speed?

Swanson: Yes, they were going. There was a liaison person at UCSF, and the [UC systemwide] licensing office was right off University Avenue in Berkeley.

Hughes: On Oxford Street?

Swanson: Yes, where university dead-ends at the campus. There was a very sharp woman that I negotiated with. I don't remember her name.¹

Building the Business

Patenting Issues

Hughes: I wonder how accustomed UC was to patenting. From what you're saying, they were pretty used to doing it. But biotechnology was new to them.

Swanson: It was a whole new field. There were lots of chemists interacting with industry, but there were hardly any biologists. So that was totally new, and even thinking about trying to bring a postdoc on board in industry, nobody wanted it. "Industry? I don't want to be associated with that."

Hughes: What about negotiating royalties? Was there a standard percentage at UC?

Swanson: I think it was pretty much open-ended. I don't know what their thinking was, but there is some reasonable value for what is contributed, and it's a matter of negotiation.

Hughes: Do you remember how it ended up?

Swanson: I don't.²

Hughes: It was not until 1980 that the Supreme Court decided in *Diamond v. Chakrabarty* that one can patent a living organism. And that was one of the things that was holding up the Cohen-Boyer patent.³ Was any of this worrying you?

¹Josephine Opalka was the UC patent administrator in these years.

²Originally, the agreement provided for a negotiated patent royalty rate not to exceed 2 percent and 1 percent for know-how, absent patents. (TDK)

³For the history of the Cohen-Boyer patent and its impact on commercial biotechnology, see: Sally Smith Hughes, "Making Dollars Out of DNA: The First Major Patent in Biotechnology and the Commercialization of Biology, 1974-1980," *Isis*, in press, fall 2001.

Swanson: Yes, well, everything. [laughter] I was worried about a lot of things. I was worried most of the time. But you sort of put a brave face on it and say, Well, maybe if the organism itself isn't patentable, maybe the genes that you've made are patentable. Obviously, the more you can wrap patents around what you're doing, the better off you are.

They had this national depository [the American Type Culture Collection] where you could put microorganisms that you'd created, because at that time, see, you couldn't adequately describe microorganisms. Here we were able to describe the genes, and you put this gene in, you put this control mechanism in, so it was much more amenable to description. I remember one of the issues was, do we have to deposit [our microorganism] as a reference in this U.S. depository as part of the patent filings?

Hughes: And did you?

Swanson: I don't remember. I don't think we did.¹

Thomas Kiley, Patent Lawyer

Hughes: Do you remember getting a patent lawyer on board pretty quickly?

Swanson: Yes. As a matter of fact, if you look at that 1980 booklet,² our then general counsel, Tom Kiley, was a patent lawyer, and he's the one that I also recommended you talk to.³ He was a partner at Lyon & Lyon, and he used to come up from Los Angeles where they were located. He gave me a special rate and slept on my couch to save me money if I bought him a decent dinner!

Hughes: So he must have been on board earlier than 1980, right?

¹Initially, Genentech did not deposit the somatostatin organism. A subsequent court decision permitted deposit prior to patent grant with relation back to the filing date of the patent application. Genentech deposited prior to patent grant. (TDK)

²"Genentech, Inc., Amendment no. 2 to Form S-1, Registration Statement under the Securities Act of 1933, filed with Securities and Exchange Commission, October 14, 1980." This is Genentech's application to the SEC to obtain status as a publicly held company.

³See oral history of Thomas Kiley, interviews conducted in 2000 by Sally Smith Hughes, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, in process.

Swanson: He says his only regret is that he didn't leave Lyon & Lyon early enough because he would have liked to get more stock.¹
 [laughter] From the very beginning of '76 he worked for us as an attorney so I had to pay Lyon & Lyon the fees. At some point between '76 and 1980, he joined the company, which was great.² He and I negotiated the early deals with Lilly and Kabi, and so it was very much of a partnership in terms of going out and doing all this.

I remember the first time I was interviewing him--I went down there [to Los Angeles]--I had Riggs along for the interview with Kiley to see whether we were going to hire him at the time he was at Lyon & Lyon. I brought Riggs because he was clearly a scientist's scientist. I said, Okay, we want an attorney who can interact well with the scientists and whom they'll feel comfortable talking to, and so that was a test. Riggs came away loving him, so I thought, Okay, this is good. Tom had come well recommended as a patent attorney, but if you don't get the information transferred from the scientists, you can't write good patents. Tom did all the early legal work as well as the patent work for us, and then eventually joined as the general counsel.

Funding Strategy

Hughes: I know of two funding waves. Isn't there a third one that comes at this early stage?

Swanson: Oh, lots of them. [laughter]

Hughes: Were those sufficient, or were there other funding mechanisms that you had up your sleeve for getting through a considerable period of time before you actually had a marketable product?

Swanson: There were two things that are probably worth mentioning. It still amazes me how few of the entrepreneurs who come in and talk to me today think about it this way, and when they leave, they think it's a revelation. It is that you have to create value. So each time you raise money, you use that money to create additional value in the company itself. Then once that additional value is created, the company is worth more, and then you raise the next piece of money to create the additional value, and so on and so on. So the trick is to raise enough money and

¹Text from interview 5 was added here.

²Mr. Kiley served as outside counsel to Genentech from 1976 and joined the company as vice president and general counsel in early 1980.

deliver on what you say you're going to do before you run out. Because if you run out, then the venture capitalists may give you more money, but it will be very expensive. That's how we thought about it from the beginning.

The first round we got \$100,000 for Boyer and me, and we put together the agreements with the universities and brought on Caltech, City of Hope, UC, got Riggs and Itakura and the team ready to go. That was more valuable than just the two of us with an idea. We raised the next round with the business plan you have here, December '76. I think \$850,000 was raised and that closed in February. Then that round was used to fund the research at City of Hope and UC that produced somatostatin. So then we proved that the technology actually could produce a human hormone.

Then I raised the next round in February the following year, 1977, and that was designed to make human insulin. So each time, it was done at a greater value of the total company. The value of the company went from \$400,000 to maybe \$3.3 million to \$11 million, and on up. And of course, if you have a company worth \$10 million and you sell \$1 million worth of stock, they get 10 percent--a little less, actually, when it's all calculated out. So that's the way I worked.

The other point that was important was that we consciously set out to try and break even on a cash-flow basis. So we tried to get partnerships or funding from companies to cover our operating expenses. That basically started about the time we succeeded with insulin; maybe a little earlier. The idea was, if you could have contracts to fund your costs of everyday research, then you could raise money with more flexibility from a timing standpoint, as opposed to being at the mercy of the investors.

So that was a very important strategy, and basically from 1978 on, we were profitable. We weren't selling anything, and there was not very much profit, or it might have been a penny plus or penny lost, but it was basically break even. Now, we used more cash to build laboratories and equipment, but the basic funding of the scientific work as salaries and reagents and everything was funded from these outside contracts and agreements, so it reduced the risk of running out of money at an inopportune time. And that's how we expected to last long enough for the products to get to the market.

Deciding against Diagnostic Products

- Hughes: One of the ways that I suppose you could have gone was towards diagnostics, and yet you were focused on what you were calling "ethical drugs." (I think that is an interesting term.) One of the reasons that startups might go into diagnostics is that the FDA approval process is simpler for diagnostics than for therapeutics, and hence it's a quicker time to market.
- Swanson: There are a number of reasons why Genentech didn't go into diagnostics. One is, what gets me really excited is curing diseases. That's what I wanted to do, why I started the company. The other, more pragmatic reason is that a lot of companies had the strategy of, Okay, I'll do diagnostics first and use the sales of the diagnostics products to fund research and development of drugs. There may be more now, but only one company I know of succeeded in doing that--Genzyme. It's a really hard problem, because there's a bunch of well-entrenched diagnostics people out there, too. And so just making and selling diagnostics, maybe the approval is quicker, but then you have competitors. And managing that can so distract you that sometimes you don't get around to producing drugs or you don't do it as well. So I think it's a very hard thing for a company to have two foci like that. Obviously, some companies have done it, but it's not easy as it might appear.

More on Focus

- Swanson: I remember in those days that Cetus spent a lot of energy looking for the perfect cloning vector. They were working with bacilli and yeast and other things to find the best way of producing all these recombinant proteins that were going to come along. We had a very simple focus: we wanted to make human insulin and figure out how to make as much of it as possible. The difference, I think, was dramatic. We actually learned more about how organisms made things by focusing on one thing and how to scale it up, rather than on--
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- Swanson: --a system that could make any number of proteins. And as it turned out, the universal system approach was harder to do, and so our focus on how do we make this one protein was really a very important difference and gave us a real advantage in the early days.

The difference between the production of human growth hormone and bovine growth hormone was at least an order of magnitude. There was 80 percent homology. For some reason, human growth hormone was made in large quantities when the DNA was hooked up for direct expression. It was much easier to deal with, but we just knocked our heads against the wall in trying to make something as close to human as bovine. And one of the reasons--not the only reason--we let Monsanto take that was, hey, we couldn't do everything, and that was probably a point where Packard came in and had some say.

We got out of the animal health business because you had to focus even more on that, even though bovine would be a natural extension of our work on human growth hormone. They had done studies that you'd get 20 to 40 percent more milk with about the same feed, so it would be a very economic benefit for the farmers. There were a number of other reasons we didn't go down that track, but making it wasn't easy either. [tape interruption]

Acquiring Diverse Expertise

Hughes: In the speech that you made in 1983 to accept an award from Stanford Business School, you said, "In private equity placements, we have actively sought corporate shareholders who could contribute more than money to our company."¹

Swanson: What we tried to do is think about not only corporate shareholders but also other investors. In some respects, the money is the easiest part to get. What you want is help in building the business. So you'd like a venture capitalist to be involved in the sense that they know the problems and issues that small companies face as they grow and maybe help you avoid some of the mistakes.

In terms of corporate shareholders, one of the early ones was Lubrizol. They competed in the motor oil additive business against big oil companies and did very well, had about a 40 percent market share. And so the aim was to understand a little bit about how to do that. We got Alpha-Laval. They made a lot of the equipment involved in production, the centrifuges and other heavy equipment for separating out the fermentation batch and making the final product.

¹[Robert Swanson], "Stanford Speech," Stanford Business School, 1983.

One of our strategies for breaking even was to try and license products we were developing to Japan and Europe and try to keep the U.S. for ourselves. We could use the licensing revenues from Japan and Europe to fund the research. One of the early investors was Nippon Life Insurance, and we were the first company outside the New York Stock Exchange they had ever owned. And yet they owned on average between 7 and 8 percent of every Japanese pharmaceutical company, so in one sense, the fact that they were an investor helped us to do business with the Japanese pharmaceutical companies. They said, "Oh, okay, Nippon Life is an investor." It gave us a little credibility.

We thought we might have to do a lot of joint ventures because we weren't going to develop the diagnostics area; we weren't going to make instrumentation. Corning Glass is one of the few companies around that had made joint ventures work very well. So we had a joint venture with Corning Glass in industrial enzymes for industrial applications. We had a joint venture with Hewlett-Packard for instrumentation. We had a joint venture with Baxter Travenol for diagnostics. The only one that really worked was the Corning Glass one.¹

Hughes: Why didn't the others?

Swanson: I think it's one of these things of focus, that a joint venture was done because there were two companies with complementary expertise that if combined could take advantage of a market opportunity. But it wasn't the primary focus for either, and since there wasn't somebody really driving it to make it happen, though it was very friendly, it just didn't work as well as we had hoped. We decided to do something else. Fluor were engineer-constructors of big plants, and we were going to have to build a lot of plants.² In fact, Fluor wound up building quite a few plants for Genentech.

I did the same thing with other directors that I'd brought on board and tried to get people with expertise. With Dick Monroe, who was CEO of Time-Life, I thought, Okay, here is somebody who's doing consumer marketing and who might help because doctors are consumers; they're just a limited group of them. And here, I have to admit, Dave Packard had one of his typically wise comments. He said, "Bob, it's nice to get help on

¹The joint ventures referred to were, respectively, Genencor, Inc., HP Genenchem, Inc., and Travenol-Genentech Diagnostics, Inc. There was also a joint venture with Prutech, Ltd. called Abaco, Ltd., aimed at making recombinant rubber. (TDK)

²Swanson invited Fluor Corporation to invest in Genentech and its CEO, David Tappan, onto Genentech's board of directors. (TDK)

the board in terms of expertise, but by far the most important thing is good judgment. Go find people with good judgment and it doesn't matter as much what their expertise is." I think he was clearly right in that area. If you can get good judgment plus some relevant expertise overlapping, it's better, but good judgment is the most important.

Hughes: Did you have any problem convincing people in those early days to be on the board of directors?

Swanson: It didn't seem to be too much of a problem. There was serendipity in this as well. I don't want to make it sound as if this was all carefully thought out. The concept was thought out, but how it all happened was pretty fortuitous. The chairman of Lubrizol had a Ph.D. in chemistry and was reading about the technology and called me up and wanted to see me.

Hughes: Really? It went that way around.

Swanson: So that was pretty lucky. When we were on our road show for our public offering, Fluor decided this technology was an interesting one for them because they wanted to build plants, and if this was going to be a new technology that required a lot of plants, they wanted to be involved. So it all fit into my plan, but it was also lucky as well.

We were introduced to Corning Glass because they were an investor in the Mayfield Fund, a venture capital fund, which was an early investor in us. Tommy Davis was one of my mentors and the senior partner of the fund. He brought Ned [Edmund M.] Olivier, Corning's head of corporate development, to show him the company and to see whether they'd be interested in investing and a collaboration. So one thing led many times to another, and luck and serendipity were part of it. But all within the context of saying, "I want the best help I can find to help me build this company, make it successful. I'm going to need money, but when I get money, I want to get expertise." So I was open to all the things that happened.

The Early Board of Directors

Hughes: Was Harry Faulkner an early board member?

Swanson: Yes. He was president of Alpha-Laval, the Swedish company. I thought it would be nice to have a European viewpoint. Sweden is the country of my ancestors, so it was a nice combination of all those things.

Hughes: Faulkner doesn't sound like a Swedish name.

Swanson: You should hear him say it. [laughter] It sounds Swedish when he says it. He may have some English in there. One of the nicest things that happened in those days was to meet with Mr. [Marcus] Wallenberg who was one of the leaders of Swedish industry. He was an older gentleman and not well, so Harry took me to meet with him at his summer house where he was just recovering from illness. He greeted me in a sweater, and then grilled me for an hour about how I was going to do this, and what my strategy was and my philosophy, and then decided to invest. It was probably less than six months later that he died, so it was one of the last investments he made. It was a thrill to be able to meet him, and he asked some of the best damn questions as well.

Hughes: Different ones than you had been asked before?

Swanson: Yes, different ones, somewhat reflecting the Swedish viewpoint. Look at the success of Sweden in this technology and a lot of others. In a very small country, they've educated very well; they've done very well competing on the world market. One of his questions was, "Well, America always does things in a big way. But how many people can you really talk to in depth in one day?" So in one sense, everyone is limited by the amount of interactions that you can have in a thoughtful way. I thought it was interesting.

Hughes: Have we mentioned all the members of the original board of directors?

Swanson: Don [Donald L.] Murfin of Lubrizol was in charge of their venture group and was the one who made the early investment. I think it was \$1.1 million that funded the development of human insulin, and the next investor to come in was Lubrizol. In '79 I think it was, after the success of insulin, they put in \$10 million at about a \$66 million valuation for the company. So when we had produced human insulin and had a contract with Eli Lilly, we had created a lot more value. The company's value went from \$11 to \$66 million. The next step up was 1980 and the public offering, which was the next major round of financing.

Hughes: Who represented Fluor?

Swanson: David [S.] Tappan came on after the public offering. Dave Tappan is still on the board today, as is Don Murfin.

Hughes: Do we have everybody on the original board?

Swanson: Well, at the time of the public offering, there were just four of us. So it was Boyer, myself, Perkins, and Don Murfin.

Scientific Advisors

Hughes: How about the early scientific advisors?

Swanson: I don't remember who they were. Is there something in these documents?

Hughes: No.

Swanson: I know we had people as advisors--

Hughes: Maybe you didn't feel you needed more than Dr. Boyer, although you said last time that Goodman and Rutter had signed a contract and then reneged.

Swanson: We tried to get them to be advisors. I'm trying to remember. A lot of companies would make big lists of their board of scientific advisors as a way of selling their company by association with people of great scientific repute, and it still goes on today. We never did that. We had people that were helping; you'd have to say Boyer was an advisor, as were Riggs and Itakura, but they were related to what we were doing.

Hughes: They were also, at that point anyway, not big names that would attract a lot of interest from investors.

Swanson: Right. No, we went for expertise. And I think you correctly characterized it and helped my own memory in the sense that part of the reason we were interested in Goodman and Rutter and some of the people that were working with them was because it was clear that at some point in time this cDNA technology was going to work, and that was an important complement to our own synthetic DNA approach, and maybe eventually would in fact be the way it was done. You actually need both, because you can't hook up cDNA for expression without some of the synthetic DNA, or you couldn't at that time.

Postdoctoral Students Opting for Industry Positions

- Hughes: Axel Ullrich came to Genentech in 1979.¹ Did he represent cDNA technology? Was that the way you acquired that technique?
- Swanson: Well, both he and Seeburg came to Genentech.
- Hughes: Because of cDNA? Is that why you wanted them?
- Swanson: Well, they were great scientists. Yes, they were very good scientists, and they were interested. Seeburg was always interested in human growth hormone; that was something he was driven to do. I think both of them felt that Genentech was the best atmosphere to actually get the thing done, that they could move more quickly at that point in a corporate environment than an academic one.
- Hughes: They were coming from a very stormy time at UCSF.² Ullrich was in the middle of the episode in which the wrong plasmid was used.
- Swanson: I don't remember--I know they had difficult times, and I think they were both in Howard's lab. Or not?
- Hughes: Yes, they were both in Goodman's lab, but Seeburg had more support, because he had [John] Baxter backing him.
- Swanson: He had Baxter, and John Shine was there too. Well, we tried to hire all three. They were at the beginning of their careers; they were working hard to build their reputation. Boyer's idea was--and this was sort of different than the academic world--he said, "Let's give them the credit." He didn't put his name on the insulin paper. And that, for a postdoc, is pretty attractive, rather than having your boss trying for the credit all the time and to keep you as the worker. For John Shine, the pull of Australia was just too strong, but Seeburg and Ullrich were available here. All postdocs go on to something else, but it was very unusual at the time that they would choose industry.
- Hughes: I interviewed Ullrich briefly, and he said he was a young man then and being employed as a Genentech scientist was an interesting thing to try. And if it didn't work out, he still had time to do something else.

¹Hall, *Invisible Frontiers*, p. 280.

²See the previously cited ROHO oral history of Dr. Rutter, and the ROHO oral history in process with Dr. Ullrich in which the contention in the late 1970s in the UCSF biochemistry department is discussed.

Swanson: Well, that's great. That statement is very enlightened in that time period, because this is the same period where Boyer was being widely criticized by his peers for selling out to industry. Hardly anybody was willing to take the risk of being associated with the evil corporation. Axel was one of the few people that said, "Okay, I think I can do good science here, and I can see that some of the products get out there to benefit people."

Hughes: Were those the two lures for getting scientists to join Genentech? Good science and social benefit?

Swanson: Yes.

Creating a Setting Attractive to Academic Scientists

Hughes: How did you spell out good science? What did that term mean to you?

Swanson: Well, it was always clear that we were going to publish our results. Everybody wanted *Nature* or *Science* or another good journal to publish their work, and so what we did had to be of a quality that would be published. So we said, "Look, let's publish the results; let's make sure we get the patents, and we'll make the patent attorneys work overtime to get them filed before you actually get the papers out. But we'll have to work together on that."

Hughes: So what you seem to have been doing is creating an industrial version of the academic world, where scientists really still are king, so to speak--

Swanson: Oh, yes.

Hughes: --and have the perks of academia and some extras--[laughs] some big extras. Industry scientists do not usually have to worry continually about how they're going to support their research and themselves.

Swanson: Right. So the advantages were freedom from seeking out grants, a chance to be owners of the company, so they had equity, and as the company thrived to have the value of their stock go up.

Hughes: Could you in addition to the equity offer them higher salaries than they were making in academia?

Swanson: Oh, yes. Postdocs continue to be very poorly paid. So yes, we could offer them good salaries.

Hughes: There must have been some restrictions on publication. Wasn't there a review process or something?

Swanson: Obviously the research had to be appropriate for publication. And review was appropriate to get the patents filed, if any, before the research was published so that we'd have full protection. Again, Boyer's philosophy, which I agreed with, was that you gain more from interaction with your academic peers than you give up by telling the competition where you are. So with interaction you can move quicker; you gain more people willing to collaborate with you.

We knew then we weren't going to have all the best ideas, and we said, Well, where do the academic scientists go when they have an idea that they think needs to be commercialized? We want them to think of us first. We want them to come to Genentech first, because this is a group of scientists that are well published and that a university scientist would be proud to collaborate with on a scientific basis, and where I know they can get this product developed and make it available. So that was a goal from the very beginning.

Hughes: Is that an instance where Herb perhaps set the pace? After all, he was an academic scientist.

Swanson: Our philosophy about people was very much the same. We were just coming from different points of view. Hiring the best people, giving them enough flexibility to do good things, giving them the credit when they do it. Obviously, if you didn't have to publish to get the best people, you wouldn't do it. On the other hand, it was very clear that in order to get the very best people, you had to have this philosophy. And Herb always had the philosophy of being much more open. I could see the benefits of it. Yes, clearly, he led in the academic side of things.

Hughes: But there could have been a clash of culture. In industry, the tendency is to keep knowledge within the company, right?

Swanson: Right.

Hughes: So did you initially take some persuading?

Swanson: We talked about how we were going to accomplish this. No, it wasn't an argument or anything. It was rather, hey, we have to get the best people. How do we get them? So it all came from the philosophy, get and keep the very best people. And they were all in the academic world; how were we going to get them to come? Well, Herb said, "I know them. If we let them publish, they'll come." [laughter]

Involving Scientists in Business Aspects

Hughes: You have these two cultures to this day--academic and industrial. You hope that their goals will be in sync, but they're not always, particularly in those early days when any scientist who came to Genentech had little knowledge of how business worked. How did you go about blending those two cultures?

Swanson: I would greet all the new employees and talk about the corporate philosophy, and the philosophy included great science and publishing our results and all those aspects of it. It also included the desire for profitable growth. So I'd take people through who had no experience with industry, and I'd say, "Well, why do we want to be profitable?" Because it sort of sounds like a nasty thing. I said, "Well, what is it really? It's understanding well enough what your customers' needs are so that you can design a product that they'll buy, and they're willing to pay you more than it costs you to make it. The difference is the profit. So the better you understand the customer, the more valuable the product you make, the less it costs you to make it, the bigger the profit is that you get to keep."

So this is really a measure of health of a company, of how they do these important things. And people would say, "Oh, I never looked at it like that." So that was one part of saying, "It's important to involve the scientists in the business decisions." They're very bright people. They don't know a lot about business, but they sometimes ask some good questions. So with those questions, you're going to involve them. You have to tell them the truth, and you have to be willing to change your approach if they come up with some new ideas.

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Swanson: They come from out in left field someplace, and you say, "Well, that's a good point." But you have to be willing to do that, or else they say, "This is just fake."

The other thing that helped us out early on and contributed to everybody--not that there wasn't always a little bit of "them and us" going on, but basically, it went very, very well--was that the scientists were also responsible for generating the revenues early on. And so when we set up licensing agreements with the Japanese or the Europeans for some of these products, the agreements said, "Gee, these products are really valuable, and if they get to the market, they're going to be worth millions of dollars. But we haven't made them yet, and they haven't gotten to market yet. So agree with us that they're worth millions of dollars. But as we deliver results that move this

product closer to the market, then you pay us a little bit more. So once we get it cloned, well, we've created some value, so pay us a million dollars. Once we've delivered you ten grams of material, we've showed you that we really can scale up this process, you have the ten grams, you can start doing your animal work, then you pay us another--" whatever the amount was. "If we have successful phase-one clinical trials that show it's safe in people, pay us another five. So only pay us once we've delivered the results."

Well, who was responsible for delivering those results? The scientists. And it was wonderful because they understood that we were trying to break even as a company so we wouldn't have to continually raise money and dilute the stock, and that they were responsible. Who made the ten grams of material? Somebody had to do that. And at some point when we were public, I remember scientists staying up until eleven o'clock at night on March 31 to ship ten grams of material to Japan so it would make it into the first quarter, because there was a million dollars riding on that. And that million came and paid for expenses.

So the structure of the arrangements, the break-even goal, all worked with the philosophy of involving scientists in decisions and in the business side of things. I think it went really well.

Hughes: You were in it together.

Swanson: Yes, we were all in the same thing. Success in the science translates to success in the business. And it was also wonderful because the goals that we set for these collaborators as having value for them were also the same goals we needed for ourselves to drive these products to the U.S. market. And so there was no or little extraneous effort. Everything was focused toward the same thing: How do we get this product into the marketplace?

The Stepwise Approach to Product Development

Hughes: I can see that it would serve you as the director of this company to have very tangible, set goals, not just, "Make insulin."

Swanson: Here's step one, two, three--

Hughes: Was that a new way of doing things? Or had industry been using a stepwise approach: you achieve a goal and you get a payment; and you achieve the next goal and get a payment.

Swanson: No, we invented it.

Hughes: Out of what?

Swanson: Necessity! [laughter] Part of it was driven by this goal. I had heard so many companies say, "We're going to lose a lot of money this year, but next year we'll be profitable." And then next year, it's the year after, and it's the year after that. I said, "This is not good for the whole psychology." So I wanted to try and drive our company to the break-even point and have people focus on that, have the whole company understand we're going to try and cover our costs as we go. We don't know when these products are going to get on the market, but if we're covering our costs as we go, then if it takes an extra year, we're not out of business.

And so that drove, "Well, this is a really valuable product we're developing. This has got maybe a \$200 or \$300 million market. We can't license it for \$30 million now because, well, it's not worth \$30 million today. But if we ever had it, we had cloned it and we were making it, it would be worth that much." So then we said, "Well, how do we capture that value, yet do the deal today so we can pay for the development?" And out of that came the steps.

Hughes: I see.

Swanson: And it all came from, What is it that creates value in what you're doing?

Hughes: Did the scientists take the monetary value of what they were doing as an added incentive? Or was that a drawback? Was that corrupting science somehow? Of course, they probably wouldn't have been in industry if they really had that philosophy.

Swanson: We had the whole spectrum of viewpoints in the company. I think having a monetary incentive was really a positive, simply because they were doing something that helped make the company successful. They could see in a very real, tangible way what they were doing had immediate impact on the well-being of the company. So it was a very positive thing. Now, was there grousing about, "Oh, my god, he's set another goal for us"? There probably was that too. But by and large, people felt really proud. "Hey, we did it!" So that was nice.

The First Genentech Scientists

[Interview 3: January 24, 1997] ##

Involving Scientists in Scientific and Business Matters

Hughes: You said in 1983 at a talk you gave at Stanford Business School about the management of Genentech science: "It's easy. We don't work on any projects we can't get someone excited about. (Sometimes it takes longer than others, but we never change that rule.)"¹

Swanson: Well, I think the key to any organization is hiring outstanding people, and helping them get excited about what they're doing. If they're really not interested in a project, they may be working on it but they're not tackling it with love and passion. So the decisions of the projects to work on were very much made not only from the business standpoint but from a science standpoint. In those early days, you had scientists coming from the academic world. So we very much got them involved in the discussion about what was it we were going to work on, and we tried to work on those things that were an overlap of our business and their scientific interest. The way Boyer used to draw it was two circles that overlapped. One circle contained the things which were very exciting from a scientific standpoint and pushed the edge of the science envelope. The other circle contained things that could be important products to treat diseases. So if you could find the overlap of those two things, you had very motivated scientists and good business.

A Rejected Project

Swanson: Just one example of where we didn't do something: one of the leading tobacco companies was very interested in having us work on an enzyme that would fluff up tobacco. The idea was that they could then use less tobacco in each cigarette because the enzyme would expand its volume. The benefit would be lower nicotine for smokers. It wasn't our mainline business but I thought, okay, you get a royalty of so much per cigarette, so maybe we should help them since this wasn't a terrible thing. The scientists said, we're not going to do anything involved with smoking. I said, "All right, we're not." It wasn't a mainstream decision,

¹[Robert Swanson], "Stanford Speech," Stanford Business School, p.

but it illustrated that decisions were made jointly between the business side and the scientific side.

Choosing Research Projects

Hughes: Did you recruit early scientists to a specific project? "If you come with me, you'll be working on insulin." Or was it, "You will be coming to work at Genentech at whatever projects seem to be the right ones for the company to pursue."

Swanson: It varied greatly with the scientists. Some people were bringing with them the projects that they were working on. Others were asked to change direction. They were great scientists but they were asked to change direction and work on some different project.

Hughes: And they knew that?

Swanson: They knew that when they came.

Hughes: Did scientists have any time to pursue their own research interests?

Swanson: Yes. Part of the whole philosophy was that everybody should have a percentage of their time, as I said, to follow their nose, even though you had to put the majority of your research focus on those projects we agreed upon. We needed people exploring for what might be next, and it didn't usually take a lot of time. But that ability to do that was key to attracting some of the best scientists, and out of that poking around came some of our next products.

Hughes: So the "poking around" was definitely with a product in mind. It wasn't just pursuing basic research interests that they may have come to the company with.

Swanson: Some of them did that as well, but we tried to make sure everybody understood that the nature of this company was to turn basic research into products that cure diseases. So if they weren't interested in that general goal, then they usually didn't come. The distance between basic research and the product is pretty short in this field. So maybe their basic research is to understand better how a particular system works, and once you understand it, then you have the idea for the product. They always had that flexibility.

Boyer's Scientific Guidance

- Hughes: What about Boyer? In the beginning his activities, as you've described, were pretty much limited to his UCSF laboratory. Did he ever spend much time at Genentech kibitzing with scientists or somehow directing the scientific effort?
- Swanson: Herb was always interactive, primarily at the board level where the basic questions of which projects we should work on were decided. He had a clear insight of what the technical feasibility was, and where you couldn't push the science too far. Was it ready now? That was a key contribution.
- Hughes: He was the only one on the board who had that kind of knowledge, right?
- Swanson: Yes.
- Hughes: I'm trying to picture the board.
- Swanson: The board was very tiny. It was he and I and Tom Perkins for many years.
- Hughes: Yes, and later when others came on--[David] Packard, for example --they came without specific expertise in recombinant DNA.
- Swanson: Boyer was always the one. I think his judgment calls were critical, such as picking chemical synthesis of DNA versus cDNA technology to make human insulin. cDNA technology was just blossoming, but it didn't work all the time and the techniques hadn't been perfected. He made the decision, "We know we can synthesize DNA for human insulin. It may take awhile but we know we can do that." I think it was a very important call.

The other thing that Herb did in those early days was wander around the labs as I did. Where my job was, "Okay, where are we on this," and to act as cheerleader to get people fired up and to coordinate between the groups; his was, in a sense, a scientific sounding board. "Okay, here's how I'm approaching this." So he was somebody to talk to about the scientific details. He did that very well.

More on the NIH Guidelines

- Hughes: Was it also in your thinking that the synthesis of DNA would not fall under the recombinant DNA guidelines?

Swanson: That wasn't the primary reason. That was a lucky-strike extra, because we followed the guidelines. We voluntarily, from the time they were announced [June 1976], we followed the guidelines --always. So that wasn't a very important part.

Hughes: What was your thinking in following the guidelines when as a company you didn't have to?

Swanson: I felt that they were reasonable in that it was important for the entire industry (which to a large degree was us at the time) to follow these voluntary guidelines. That way the government could keep them as guidelines and avoid the mistakes that the Japanese and the Dutch made when they turned them into legislation--which was much more inflexible and actually caused a great delay in the development of companies in those countries. [pause] Every six months the guidelines would be reviewed, and the NIH Recombinant DNA Advisory Committee would say, "Gee, there were no problems, let's reduce them."

New University-Industry Affiliations

Hughes: Was criticism from university scientists for having moved from the "pure atmosphere" of the university lab into industry something early Genentech scientists had to bear?

Swanson: Yes, they did. It made it very difficult. As you know, we got Herb Heyneker, the first scientist we hired. Basically, we had to go to Holland to bring him back. The only reason we got him is Holland had passed a law prohibiting recombinant DNA research. I remember later trying to hire Art Levinson who was working as a postdoc in [Michael] Bishop's lab at UCSF; Art Levinson is now CEO of Genentech. He was being recruited by [James D.] Watson at Cold Spring Harbor [Laboratories] and a number of other places. All of the professors told him he was completely nuts even to think about joining an industrial company, and they just couldn't understand why he might even consider it, let alone why he did it.

Hughes: Why did he do it? [laughter]

Swanson: Well, I think you can talk to him about that. I think he saw it the way a lot of people did: this science is blossoming, and we see how we can use this to solve important medical problems, and

we want to be part of the conversion of this basic research into something useful.

- Hughes: Commercial application was a new idea in biology, was it not? Biologists had been oriented towards basic research, and, if there was an application, it was somewhere off in the distance.
- Swanson: Right, this was really the first time, except maybe in the area of plants, where academics in biology could see what they did had a more immediate application to commercial purposes.
- Hughes: Who was hooked by that notion? Why some scientists and not others?
- Swanson: Hmm. I don't know. In anything new, you have some people that are more willing to take risks than others, and that's what we saw there. [interruption] You could see it in the personality makeup of the scientists who were among the first versus those who came later. Among the early scientists, there were more explorers open to trying something new before it had been proven.

The Pajaro Dunes Conference on University-Industry Associations,
March 1982

Concern in Academia about Commercialization

- Swanson: The other thing was how this new link between academic biology and industry caught biologists by surprise, and it also caught some of the academic professors and university presidents by surprise. You had mentioned [off tape] the meeting at Pajaro Dunes [California], which was very interesting. I remember the exact time it took place [March 1982], and here you had the presidents of five universities and provosts and deans and a number of people from industry whom they invited. You had two people who were very concerned: Presidents Donald Kennedy at Stanford and Derek Bok at Harvard. Then you had Presidents David Saxon from the University of California and Marvin Goldberger of Caltech and Paul Gray from MIT. The three of them said, "Well, this [commercial application of recombinant DNA] is nothing different from what ordinarily happens. As a new science develops in the academic world, it eventually has commercial applications, and the science is transferred to industry, and people from the academic world migrate to companies."

But both Kennedy and Bok were really disturbed. They thought that this was going to wipe out scientists in the

academic world--everyone was going to leave. They were concerned about the progression of the science. It actually was very funny because Kennedy was almost dictating, and Bok was writing down the notes of the meeting, and everybody else was saying, "What's the big deal?" It was a lot of fun. In a sense, it reflects your question about the newness of biologists to this commercial side. [silent while Swanson reads documents]

Herb, I thought, did it very well. It's good that we were the first and we set the standard, but it looked even better by comparison after a number of years where he said that his own research in his [UCSF] laboratory went in a different direction than the company's. He acted as a director and consultant to the company, but he continued to teach and do his own research at the university; continued to follow his nose into new research areas. It seemed to me that having made that choice, Herb handled it very well.

Turmoil at Harvard, circa 1982

Hughes: At about this time, there was considerable turmoil at Harvard over Wally Gilbert's connection with Biogen and the question of whether Harvard was going to be a part of that venture. I wonder why he wasn't at Pajaro Dunes.

Swanson: I don't know. One of the concerns in the academic world was triggered, to some degree anyway, by the way Wally Gilbert handled his starting of Biogen. He wanted the best of both worlds: to maintain his tenure at Harvard and yet spend one hundred percent of his time making money and working for and building Biogen. I think that triggered a lot of concern and was inappropriate. As you make that transition, you have to make the call: do I want to be a university professor or do I want to be an entrepreneur?

Hughes: Well, let's establish the setting for Pajaro Dunes. It was March of 1982, and it was a conference which Donald Kennedy had originated.

Swanson: Clearly he was one of the leaders.

Daniel Tosteson

Swanson: Before I forget, I might mention one thing. One of the people that most impressed me there, Dan Tosteson, was dean of the School of Medicine at Harvard. My relationship with him started there because of the reasonableness of his approach on this whole subject of the relationship of academics with industry. [interruption] He was very thoughtful in his approach. So later on when I was looking to have a medical doctor join the board, and one from the East Coast to give us that view of the world as well, I went to ask him. He felt that he couldn't do it because of his position but introduced us to John Potts, who was head of the department of medicine at Mass[achusetts] General Hospital, who did join our board. For years now and at Dan's request I've been on the board of fellows at Harvard Medical School, which has been a nice long-term relationship that started here at Pajaro Dunes. One of the nicest things Dan said was that he wished he had made a different decision, that in retrospect it would have been okay, and he would have loved to have been on the board. So, it was very nice, and I still enjoy seeing him a couple times a year at the Harvard Board of Fellows.

Donald Kennedy and Derek Bok

- Hughes: Well, the way it apparently went was that each university president was told that he could invite five people to the Pajaro Dunes conference. Who invited you?
- Swanson: Actually, Kennedy was the person who invited me; I was under the Stanford umbrella. It's interesting because most of my relationships were with the University of California at San Francisco and Caltech and of course my alma mater and people I knew very well were MIT. [laughs] So it was very funny that I was under the Stanford umbrella.
- Hughes: Well, describe what went on.
- Swanson: Well, I described a little bit earlier that Kennedy at Stanford and Derek Bok at Harvard were the two individuals most concerned about the technology, the risks, the loss of people from the academic world to industry, and how to structure relationships with professors who were interested in starting companies. By and large, people from MIT and University of California and Caltech thought, "What's the big deal; this thing has been going on forever in chemistry and physics." I think it may have been that Don Kennedy was a biologist and Derek Bok was a lawyer. So

Kennedy expressed his concerns and Bok wrote them down as minutes. [laughing] It was a lot of fun, but what a group of people was there!

Agenda and Access

Hughes: This is an excerpt from an account of Pajaro Dunes in *Science*:

The conferees at Pajaro Dunes set no policy, reached few firm conclusions, and failed to agree on some of the more contentious issues, leaving their resolution to individual university faculties. What they did do, according to Stanford University president Donald Kennedy was "get some general principles on the record" and "set an agenda for further discussion of the issues."¹

Was the intent to have a discussion but not to set firm guidelines? Do you remember how the conference was described at the outset?

Swanson: I don't remember. What this reminds me of was the big brouhaha about people wanting the conference to be open. It wouldn't have worked at all that way because you needed attendees to be free to express their interests without some of the more radical groups that obviously wanted to be there.

Hughes: I wonder whose decision it was to close the conference.

Swanson: I don't know. It must have been Kennedy's, but it's only my guess.

The Biohazards Issue

Swanson: We forget, with the products that have come out of biotechnology and the success and the safety that is evident, what an incredible uproar it caused in those days. You had the *New York Times* with an editorial against the technology. You had the city

¹Barbara J. Culliton, "Pajaro Dunes: The Search for Consensus," *Science* 216 (1982): 155-6, 158 (April 9).

of Cambridge prohibiting it within its borders. It was completely crazy.

Hughes: Yes, and Derek Bok had just lived through that. So you can understand why he was edgy.

Could you understand people's concern? Was it ever in your mind that this technology could lead to problems?

Swanson: [pauses] It really was never a concern of mine. I felt a lot of the discussion in the press and the verbal concern outside came because of an overreaction to the Asilomar Conference, in which you had a group of scientists being very responsible and saying, "Well, let's explore this new technology to make sure it's safe." [interruption] So, they took a very responsible approach at Asilomar, and the reaction from the outside world was, "Oh, my god, scientists have never done this before. If these guys are at all concerned, this must be really dangerous." As Herb used to say, if you understand biology and how difficult it is to survive as a microorganism in any of these niches, if you change them and weaken their competitive advantage, they're not going to survive outside. There was a time when somebody at some university drank a liter of *E. coli* bacteria just to show it was safe. There were lots of things going on there, but I think it was largely overreaction. Yet, I thought because it was done in a responsible manner by the scientists who set up these guidelines, that we should follow them.

Swanson's Opinions on Issues in University-Industry Associations

Hughes: Let's return to Pajaro Dunes. There were several issues discussed, and one of them was whether research contracts between universities and industry should be made public. Another issue was, should universities be allowed to grant exclusive licenses to for-profit companies? Should universities invest in companies in which one of its faculty members is a major stockholder?

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Hughes: Can you remember some of the discussions?

Swanson: I remember all those issues. Many of them are still being discussed, so they haven't gone away. I have very clear opinions about them. The first one is, can an academic scientists be involved in industry? At some point they have to decide whether they're an academic scientist and a teacher and a researcher, or

they're an entrepreneur. I think most universities say that you can be a consultant for maximum one day a week. So as long as you're within the guidelines of the university, and your heart is in teaching and research, then that interaction is appropriate. If not, you should leave the university and join the company.

Industry Funding of Academic Research

Swanson: The next issue at Pajaro Dunes was related to whether the companies could fund research in these academic laboratories. Before the major government funding of research, it was all funded by corporate interactions. While they had forgotten that, no one was too concerned about the corporate funding of research. But still today there's concern if the funding is in the laboratory of the person who has some interest in the company. There the concern is, "Gee, how can we keep him from using his graduate students as slaves to make money for his corporation?"

Hughes: Do you see that as a problem?

Swanson: I see it as an issue but not a problem because scientists within the academic world should be limited to doing work that is on the forefront of science. They're not a production department for a company. I think that issue can be dealt with by full disclosure: What is the research that the company's funding in the laboratory? Who is involved in it? Do they understand that it's a contract from the company? Is this the kind of research that's appropriate for the academic world? If it's disclosed and the provost or whoever just reviews these contracts on a regular basis, you'd eliminate all the issues. The universities want to have that kind of interaction --without somebody misbehaving. And why do they want it? Well, I can give you an example. MIT still doesn't allow this, and I know some other schools don't.

Hughes: Don't allow--?

Swanson: Don't allow professors to accept funding from companies in which they have an interest. But the reason you want that from the point of view of the company and an academic point of view is that the person with the greatest incentive to see that the research is done as quickly as possible and the results are got out are the people involved in it, and they're driven to get those results. So probably the best way to get the research done is to have somebody do it who is interested in the project, because he's shown that interest, and he's been involved in the company that is sponsoring it.

I'll give you an example where it goes completely crazy and is uneconomic. A company I'm involved in in Boston has professors from MIT who are consultants and shareholders. They're not active at the company, but they own some shares and are consultants. The company cannot fund research in those professors' laboratories, so it's funding at Harvard with somebody who doesn't have the same degree of enthusiasm, and MIT is losing out on that source of revenues. The research doesn't get done as well. So I think it's an issue, and I think the way to solve the issue is through full disclosure, and basically most people do it right to begin with.

Hughes: If this became a pervasive mechanism, would there not be the danger of shaping university research projects for commercial application? And in the long run maybe everybody would lose out because industry requires the information, the knowledge, that comes from basic research?

Swanson: Well, the thing that comes out of the university is that all the professors there have to publish. So any of the arrangements they make always include the absolute right to publish the information so the research will be out in the public domain. So there's not an issue. Your question is maybe more basic. There's a debate within the NIH about how much money should go for a war on cancer versus a basic understanding of cell mechanisms and things like that. The same debate goes on within the academic world. I think it probably comes back to a balance. It comes back to what we want as taxpayers. Why are we comfortable that part of the taxes we pay to the government goes for government funding of basic research? We hope that basic research will lead to discoveries that eventually can be licensed to industry to develop products which will come back and benefit us. So we hope that the decisions get made in that environment, that is, the right mix between basic and more applied research, that gets those products cycled back to us.

Exclusive Licenses

Swanson: This comes to the last point you talked about, which is the appropriateness of licensing technology from an academic institution to a corporation on an exclusive basis, and maybe even a tiny company versus a giant pharmaceutical company. [tape interruption] I think that can be approached from several directions. One is the basic understanding that nobody will invest their money in something unless they know they will have a return or at least a chance of having a return from that investment. Part of that understanding comes from what kind of

patent protection can be achieved. So you would feel better about investing your money if the results of the research could be patented and then licensed exclusively to wherever you were making an investment.

[Alexander] Fleming donated his discovery to the benefit of the world, but eleven years later there was not enough penicillin available to save one man's life. It wasn't until World War II that production of it really took off. Part of the reason was that there were no patents, and English industry didn't invest in it because they were sure the Germans would come up with a synthetic way of doing it that didn't require fermentation. Yet here was a donation of a discovery to the benefit of the world, and it didn't go anywhere. It's clear that someone has to have an interest in the success of a discovery and to think that their investment will earn them money in order for it to work. So that's why patents are so critical to the development of drugs and the transfer of this technology.

Now, would you invest more money in the development of a new technology if it was licensed to ten other people at the same time or was licensed exclusively to you? You'd invest more money if you had the exclusive rights to it because you would know that at least for the period of time that you had this legal monopoly of the patent, you would have the ability to defend that right by trying to keep other people out. Eventually when the patent ran out, you'd have competition.

So then the question becomes big companies versus small companies. In some ways the small companies are completely dedicated to seeing projects through to a successful conclusion. If the product doesn't get to the marketplace, they don't survive. So it's a decision that licensing departments of universities have to make in terms of how to get the discovery to the market the quickest and also how to maximize their return for the invention. The U.S. government has said universities, even though the taxpayers pay for public universities, get to keep the technology rights and earn royalties and all that, even though they can't be in the business of making and selling commercial products. Oftentimes the university opting for the small company can get equity and thus increase its return over what it might obtain by licensing the technology to a larger company for a mere royalty.

Summary

Swanson: We've talked about a bunch of different issues related to technology coming out of the academic world and how it gets commercialized and what should be the interactions between the professors and corporations. I can summarize my beliefs. Among the greatest strengths of the United States, and they don't exist today in almost any other country in the world, are the ties between the academic world and the commercial world, and the speed with which new technology can leave the university and be commercialized by an early-stage company, and get out to benefit the people who are actually paying for the research through their taxes. So that's a real advantage to the people of the United States, but also to the country's competitive position in the world. No one can do it like we do it.

Hughes: Where do you see this going? Industry having a larger role in all areas of production and research?

Swanson: Well, it almost becomes a political philosophy. There are so many demands on the tax dollars, from funding for Medicare to the military to highways. I still believe that the country is better off if the government continues to fund basic research at the university because it provides such a strong base of knowledge which can then be commercialized. It really is an advantage to us as a country, so I believe it should be continued. Now, tradeoffs have to be made with limited dollars, and certain funding is getting tighter. Industry can never match those government dollars. I think the total spending for the pharmaceutical industry is about equal to the NIH budget, maybe a little less, maybe a little more. At one point, I remember looking at the numbers and they were both about ten billion dollars or something, and they've both probably gone up quite a bit since then. There's no way that industrial funding of basic research in the university could ever take the place of government funding, so I don't think that's a risk. But what is a risk for the country is that the funding of basic research decreases to the point that it no longer provides tools that companies can use to develop new products.

Genentech Expansions

Sansome Street, San Francisco

Hughes: Genentech was not always at Point San Bruno in South San Francisco. Do you want to talk about the earliest locations of the company?

Swanson: Sure. My philosophy was that until we knew that we could use this technology to make a commercial product, it didn't make sense investing in bricks and mortar. So from the earliest days (and we talked about this), I set up agreements with Caltech and City of Hope and University of California, San Francisco to fund basic research to prove whether you could make a human hormone in a microorganism. These institutions would receive royalties if there was success with that. So we funded the costs of research plus overhead. So in those early days I needed a place to operate because it was basically myself as the only employee. I was able to get an office in Wells Fargo Bank's venture capital office in San Francisco. They had some very nice offices, but the junior people had all left. The head of that operation actually leased space to me. I leased an office and a part-time secretary. She kept track of her hours, and I got a bill at the end of the time. I think the first capital purchase for Genentech was a filing cabinet. Wells Fargo didn't have any so I had to buy my own.

I worked out of there and negotiated agreements with the universities and City of Hope and then was responsible for oversight. The DNA was being synthesized down at City of Hope and Caltech, and when they got segments, I'd bring them up to Boyer's lab at UC. They were linking the segments together and doing the cloning. The expression work would go back to City of Hope where Art Riggs would do that. So I was very much involved in the logistics of this research project from the office at Wells Fargo, as well as trying to build a company and raise the money. It was a very tiny office and I'd have to go over to the offices of Kleiner & Perkins, which were at number three Embarcadero. My office was on Sansome Street. Two-twenty Sansome, I think, was the address of this Wells Fargo Bank annex building. If I had visitors, I'd say, well, I'll meet you at the investors' office, because they had a conference room we could use. [laughs]

Hughes: Well, you make this approach sound very common sense. Yet, I read in an article in *Esquire*¹ that you were violating several implicit rules of high-tech entrepreneurship as practiced in the Silicon Valley in the 1970s, where money was heavily invested in the plant and equipment. The way you tell it, it was just an expediency.

Swanson: It was mostly common sense. We all believed we could do it, but no one had done it before, and when we finally hooked up the DNA for somatostatin the experiment for expression actually failed. I got physically sick because I said, "Oh my god. Oh, this is my career." Well, it may have been the Mexican food that we had that night [laughs], but I was not feeling well. And then a few months later we succeeded. But it would be silly to invest in a plant and equipment and laboratories until you knew that the technology was indeed ready for commercialization.

Point San Bruno, South San Francisco

Swanson: So, as soon as we succeeded in expressing somatostatin, I started looking for space. Through some social arrangement, I met Bill Banker, Jr., who was the son of a founder of Coldwell Banker. He took me around looking for space in South San Francisco, trying to find a place where we could set up our first lab. We finally found a corner of a very big warehouse, which I thought was terrible at the time because it had all these air freight forwarders in there. It turned out to be very lucky. Sometimes you get lucky even when you don't try because eventually as we grew, we were able to buy them out of their leases and grow down the building without actually moving from one building to another.

The First Genentech Scientists

Hughes: The successful somatostatin experiment was the impetus for moving from Sansome Street to South San Francisco?

Swanson: The successful expression of somatostatin was, because at that point we said, "We know that we can make these proteins in *E. coli*."

¹Randall Rothenberg, "Robert A. Swanson, Chief Genetic Officer," *Esquire*, December 1984: 366-74.

Hughes: Insulin had not happened?

Swanson: Insulin had not happened, but the lab was set up to do it. So then we hired Herb Heyneker and Dave Goeddel and Dennis Kleid. David and Dennis came from SRI [Stanford Research Institute]. Those were the first three scientists. We built this little lab in South San Francisco, and they joined. The DNA was still being made at City of Hope where we helped finance an expanded lab there to do that. We were doing the cloning and expression work at Genentech. So the first real commercial product was at Genentech.

Hughes: Did Heyneker, Kleid, and Goeddel ever take over the actual synthesis of the DNA? Was that always handled by City of Hope?

Swanson: It was, until a little bit later. Then the second-in-command scientist at City of Hope came to Genentech to head up the DNA synthesis lab.

Hughes: Who was that?

Swanson: Roberto Crea.

Hughes: You moved to South San Francisco in February 1978. Is that about the time that Crea would have come?

Swanson: Crea wouldn't have come till after insulin. That success was the summer of '78. So probably he came in the fall or the early spring of that year. I'm thinking about it in terms of expansion of the facility. We had that first small lab, and after the success of insulin we added a DNA synthesis lab and another cloning lab. Peter Seeburg came about that time, along with Roberto Crea.

Hughes: And Axel Ullrich.

Swanson: And Ullrich.

Hughes: Didn't Seeburg and Ullrich come at the same time?

Swanson: Seeburg may have been a little earlier. I'm not sure.

Hughes: Do you want to say anything about the recruitments of any of these people that you've mentioned?

Swanson: I don't know if Roberto Crea was a postdoc. He had come from Italy to learn under Itakura at City of Hope these techniques of DNA synthesis. He had been responsible for doing the work for the insulin gene at City of Hope. But he was always more commercially oriented and Itakura was more academic, so Itakura

has gone on to do other scientific things there. Roberto wanted to be part of a company. After he left Genentech, he started a number of companies --one called Creative Biomolecules, with "Crea" as part of the company name. He's a wonderful Italian man and very enthusiastic. So he was anxious to come. We were in this transition from the academic world to the commercial world. So here we were going to be synthesizing DNA for products we brought into the company.

Hughes: What about the recruitment of Kleid and Goeddel?

Swanson: Herb Heyneker had, I think, already gone back to Holland. He'd agreed to join Genentech, and then he had to go back for some reason and wasn't going to be back until the end of the summer of seventy-six or -seven.¹ He had recommended Kleid and Goeddel, who were in a small department at Stanford Research Institute. Kleid had set up this department and had recruited Goeddel from the University of Colorado. Goeddel had come here because he wanted to be in California. So I went down and had lunch with them and said Herb had recommended them and would they be interested in joining. Kleid was more conservative, but Goeddel said, "This is what I want to do. I'm going." So finally Kleid said, [laughs] well, it was his department, and he'd better go, too. So we got both of them.

Growing Genentech

[Interview 4: February 7, 1997] ##

Turning Genentech into a Fully Integrated Company

Hughes: Mr. Swanson, I just showed you some documents related to Genentech's early history. One of them is a letter that Middleton sent you in which he said that in December 1978 Genentech completed a business plan with "a strategy to become a fully integrated manufacturer and marketer of genetically engineered products."² Could you comment?

Swanson: Well, from the very beginning, I set a goal that as soon as we could, we wanted to make our own products and sell them. Obviously, we couldn't do that right away. We had to be careful

¹Heyneker returned in the summer of 1978. (TDK)

²Fred A. Middleton to "Bob," April 6, 1979. (Chief Financial Officer files, Genentech.)

which products we took first to do that with. With human insulin, Eli Lilly dominated the market with 80 percent market share. It was sold through pharmacies. It would have been a very difficult product for us to take to market ourselves. On the other hand, growth hormone--which was the first product we did take through the FDA approval process and make and sell ourselves--was then being distributed by a quasi-governmental agency called the National Pituitary Association and was extracted from the pituitary glands of cadavers. There was less than nine months' supply for the children that needed it, and there was the risk of getting Creutzfeldt-Jakob disease or slow viruses along with it.

So here was something where there were really no entrenched competitors. We had an alternative that would be safer. There were about five hundred pediatric endocrinologists around the country who were treating these children. This was the kind of product that a small company like Genentech might be able to take to the market itself. Also, the government approval process--although more difficult than we imagined because of our naivety in terms of understanding what it took to go through that process--was straightforward in the sense that either the children were growing or not. So the end point was easy to measure. Something like arthritis--"Does your hand feel a little better today?"--is more difficult to measure, and it therefore takes longer to accumulate evidence of efficacy. Here the trials could be short and more definitive.

It was a goal from the very beginning to make and market products as soon as we could. The first products we licensed to others. We tried to keep some manufacturing rights but let other people market. That was the case of interferon with [Hoffmann-La] Roche, but eventually we decided it was better to put our energy into the products we could make and sell ourselves. We decided not to exercise an option to manufacture a portion of Roche's interferon requirements but continued to collect a royalty from Roche.

Now, why is it that you need to be an integrated pharmaceutical company? Over the long run--and really the timing is when you can achieve it--in order to capture all the value from the research that develops a new drug that treats a disease, you have to be able to make and sell that drug yourself, in part to control the distribution of it, not relying on someone else; and in part because you capture greater rewards by selling it yourself. Over the long run, unless you capture those rewards, you cannot invest as much in R & D that allows you to develop the second and third products.

I saw a figure yesterday that to develop a new chemical entity today--including the costs of all the ones that fail--is six hundred million dollars. I think it's probably overstated, but it's a very big number. The total cost for us in developing tissue plasminogen activator, Activase, was two hundred million dollars before we got to sell one vial. So there's enormous development cost before you get to sell anything. But if you plan right, you are able to achieve patent protection for what's left of the patent life after the time it takes you to get approval. So the margins you are able to achieve and need to achieve in order to fund the next round of research can be in the 80-85 percent range. You can compare that to, say, a 10 percent royalty. If you are able to sell even ten million dollars of a product, and obviously you'd have to subtract your costs of sales and stuff from that, maybe as much as four million dollars, you achieve a contribution margin of six million dollars, whereas a 10 percent royalty on that would yield only one million. So over the long run that ability to capture greater value for your creativity in new drug development is going to be critical in terms of long-term survival. It can't be done at once obviously, but as soon as you can I always felt that you needed to do that.

Hughes: Was this established business dogma?

Swanson: No, this was not a common philosophy at all. In fact, the common philosophy at the time was, it's impossible to build a pharmaceutical company because look at how long it takes--seven to ten years--to get a new drug approved, and the amount of money it takes. No one could do that. So anybody starting a company would just have to accept royalties. There are companies that set up that policy. They said, "Okay, we're just going to do development. We'll collect royalties and then do more development." I think our approach was scoffed at a little bit. It was said, "Well, what makes you guys think you can do this? You know, it's very difficult." We just said, "We're going to try. We're going to go for it, and hopefully we'll be successful."

In those days, the only model for a new pharmaceutical company was Syntex, which was founded in the fifties. Basically it was birth control pills that propelled them, but even then they licensed J & J [Johnson & Johnson] and had little right to sell themselves, so they leveraged themselves in the beginning. That was then the most recent example of a new pharmaceutical company that succeeded in getting to a significant size and making and selling its own product.

Getting FDA Approval

Hughes: I read that because these proteins were natural molecules, the FDA approval process might be faster than it was for the small-molecule drugs. What indeed happened?

Swanson: Well, I think your assumption is correct in that if you're making human growth hormone from a microorganism, it's still human growth hormone and you know a lot of the properties. It's not a mixture of chemicals from off the shelf where you have to worry a lot about the toxicity. With growth hormone, there may be toxicities related to the molecule--which are obvious: you get too much, you get acromeglia--but at least they were well understood, and also the dosing was understood. They had been giving it to children; it just came from a different source. Then you had the issues of how is it formulated and what are the impurities? But those weren't primarily the issues. I think the FDA in those days felt that we had some of the best science. They compared us to Merck in terms of the quality of the science that we came in with. But they thought we were incredibly naive in terms of what it took to get a drug approved. They wanted their reports in a specific way. It took us a while to understand that it didn't matter whether that made the best scientific sense. [laughter]

Hughes: That's what they want.

Swanson: If that's what they want, that's what they're going to get. And delivered exactly as they want us to do it and in fact almost to overdo them. It took us a while to understand that, and as a result there were delays. I think it took us a year longer than we thought to go through that process.

Hughes: Because Genentech hadn't supplied the right data?

Swanson: And the kinds of studies that were done. When you have academic scientists--whom we had mostly--there are right approaches and wrong approaches. We would say, "This is the correct scientific way to approach it." Well, it wasn't a question of that. It was, "This is what we [the FDA] want." And in some cases what they wanted proved to be right because of their long experience, and the human body is pretty complex. It did take us longer than we thought. Eventually we got approval. Growth hormone was the second drug approved, insulin being the first. But Eli Lilly carried the ball with insulin, and then we did human growth hormone.

Hughes: Did you think it necessary to hire people that had had experience with the FDA? Or was it a matter of learning by doing?

Swanson: Well, no. One of my philosophies is, I try very hard to get the best people in every area of expertise, whether it be marketing or finance or manufacturing or FDA approval. The kind of people that you're able to attract changes at different stages of a company's development. At the early stage, you might find a great person that is also a risk taker, who has a higher risk profile than someone hired when the company is a little larger and who is a little more methodical. So we had some people like that, but obviously we didn't have enough. The person who was heading the regulatory group--who did an amazing job--was Mike Ross. He's gone on--he was the number ten employee--to start a couple of other companies. He's president of a local company now.

Hughes: What was his background?

Swanson: He was Dartmouth, Caltech Ph.D, and he was doing his postdoc at Harvard when we hired him.

Hughes: And he was hired as a scientist?

Swanson: Scientist, yes, but he was in charge of a number of things. He was given the task of coordinating the efforts for growth hormone approval. We had people, as consultants initially, who would help us figure out how to do it. Mike did an incredible job, but we were naive in terms of what it took, and so we made some mistakes.

Acquiring Diverse Expertise

Hughes: Comment, please, about acquiring expertise in many areas; the areas are mentioned on the second page of Middleton's memo.¹

Swanson: Yes. [reading] "Genentech completed the hiring of its core management and technical teams in Manufacturing, Finance, Marketing, Organic and Biochemistry, with a total of thirty employees." [laughter]

Hughes: By year end, which is 1978.

Swanson: Right. Late that summer we had succeeded in cloning and expressing human insulin. So that was really the beginning of the first product that got approved. We had already reached

¹Ibid.

arrangements with Lilly on that. We had signed an agreement with Kabi for marketing of human growth hormone.

Hughes: Which would explain some of the increase in staff that happened at this point.

Swanson: We had success, and I tried to organize things so that once you had success and created value in the company, then you raised the next round of money for the next success that would create greater value, and added the people that allowed you to do it. So it's sort of building a staircase with steps that you can negotiate each stage, that involves an achievement of something that creates value, raising money off of that to achieve the next step in value and what additional money is needed, to the point where your cash flow is positive from product sales.

The Recruitment Process

Hughes: What did the recruitment process involve? How did you find good people?

Swanson: Well, in each case it was different. We used head hunters quite a bit to try and find the nonscientific types. The scientist types generally were referred by other scientists because with the publishing of papers and the small network people knew who was good in a particular area.

Hughes: The referring scientists were the ones already at Genentech?

Swanson: Yes. The first scientists, as I mentioned, were Herb Heyneker and Dave Goeddel and Dennis Kleid. Then from them and from Boyer we were able to identify other expertise. We needed organic chemistry to synthesize the DNA, and so we hired Roberto Crea-- who was working under Itakura at City of Hope--and he wanted to be part of a commercial enterprise. We needed protein chemistry, and they identified Mike Ross who was in a lab at Harvard doing protein chemistry. We had to begin primarily with molecular biologists, but we ultimately would have to learn how to purify and handle and formulate these proteins. In manufacturing, we used a headhunter to find a manufacturing leader, and Brian Sheehan helped bring on board the first fermentation equipment because we'd have to grow bacterial clones on a larger scale. I think we looked through a headhunter for a head of finance, but I finally hired somebody I knew from MIT who had a lot of experience with Chase Manhattan Bank and MacKenzie. That's Fred Middleton. He became the first financial vice president. I think we used a headhunter to find a marketing guy, as well. It

was very hard--in marketing, particularly--because some people had been used to working in a big company where you started in sales and worked up in the organization that way; but it was very compartmentalized. So until you got to the very top, you had no experience with any other part of the process.

At Genentech there was great interaction between all the pieces. We finally found our first marketing guy, Bob Byrnes, who had worked for a small division of American Hospital Supply. They actually had pharmaceutical products, whereas American Hospital Supply usually supplies all other needs to hospitals in more of a big distribution operation. They had this small pharmaceutical division with sales of maybe less than a hundred million dollars. But there was enough similarity that we could find somebody who would identify with a smaller enterprise.

Hughes: What was the incentive for people such as Middleton and Byrnes to come to Genentech?

Swanson: Well, the excitement of building something new. Also, the opportunity to be an owner. All the people at Genentech were offered the opportunity to become shareholders, at different levels. Obviously if you were part of the senior team, you were offered a greater opportunity. There's an opportunity to build significant wealth, along with building value in the company.

Hughes: Even in such a new company as Genentech, you think that was an incentive?

Swanson: Oh, yes.

Hughes: People probably wouldn't have come if they didn't think there was potential.

Swanson: Well, some of the scientists didn't believe that the stock would have any value. They just wanted to be on the forefront of science. Then, I'd say, "Look, you want to be an owner and have some stock, too." They'd say, "What is this good for?" They found out soon enough. After the public offering in 1980, a lot of them said, "Oh, my goodness, look, I'm now worth some real money." So that was nice. But the business people understood there was an opportunity to build an ownership position.

Hughes: You're saying that scientists came to Genentech to do science but not so much to do science to make money. Why do scientists come to industry nowadays?

Swanson: Well, it varies, depending on the scientist. There are some people who are interested in making a quick dollar, if you could put those terms around it. The scientists I was involved with

and the people at Genentech were interested in being able to do better science at Genentech. We had the ability to synthesize large quantities of DNA, and no one else did. So they could do experiments at Genentech that they couldn't do any other place. We had the state of the art in terms of some of the cloning expertise. So there was an opportunity to do science better than they could do in the academic world. They didn't have to do the grant-writing process.

Creating Value in a Company

Swanson: The scientists were creating value in an organization, and we had structured it in such a way that they got to share in the value that they helped create. They got paid a salary for going to work every day, but if they created more value in the company, then they had a piece of that value. I think that's still the right way to think about it. There's a discussion now, "Okay, I've got this idea. I'll get a few scientists together, and I'll hire people, and I'll crank it up, and I'll raise more money, and I'll get the public offering. Well, look at how much money I'm worth." It's putting the cart before the horse. If you create value in the organization by discovering a new drug, building an outstanding team of people, getting the product to the market-- whatever it is that creates more value--then eventually that value gets reflected in the price of the shares of the company. The market goes up and down. You're building value all the time. Maybe the market doesn't reflect it one year but eventually it does. Maybe it over-reflects it, but as long as you focus on building the value of the company eventually that gets reflected in the stock price. That's the way I've always talked to people about it, and I think it's the right way to think about it.

Hughes: I was struck, when I first came from the university to Genentech to see the very tangible presence of corporate value through the monitors which seemed to be in just about every unit, showing what the stock is doing.

Swanson: I may have a somewhat naive approach to this, but I think most people don't do things for money. If they do it just for money, rather than the love of it and the desire to do something, then they're probably not as good at whatever it is. I think people by and large do things for other reasons.

The 1979 Corporate Plan

Hughes: I'd like you to take a look at the 1979 corporate plan.¹ [tape interruption]

Swanson: We're looking at the 1979 corporate plan which reviews the corporate milestones. What it reflects is exactly what we've been talking about: Boyer and I coming together in '76; we raised a hundred thousand dollars; we negotiated the agreements with the universities; we got the first somatostatin project started in February of '77; and then we raised money to fund that project. But it was money raised based on the fact that we had all these agreements and were ready to start. We succeeded in making the first successful human hormone [somatostatin] in August of '77. We then started on insulin, and we moved to our own facilities at 460 Point San Bruno to do that. With the success of somatostatin, we raised the third round of money. So each success drove up financing through the next step.

In August of '78, we had human insulin, and we had signed contracts with Lilly to make and sell it. We'd signed contracts with Kabi for growth hormone, and we began working on producing human growth hormone. We had also begun working on human interferon, and eventually that would lead to agreement with Roche to sell that product. We expanded the facilities in December of '78, and Seeburg and Ullrich came about this time because those facilities were built for them.

Scaling Up the Technology: Fermentation, Purification, and Formulation ##

Swanson: We were doing the early scale-up of some of the fermentation processes in '79 and learning how to make these products in bulk.

Hughes: Did manufacturing in bulk present surprises?

Swanson: Yes, it did. You asked about hiring. Actually, the first two people I hired were also among the first that we had to let go. One was my first secretary who became an office manager in a sense and did everything. But she was so autocratic, the scientists would actually wind up coming in the back door to avoid her yelling at them. Of course that couldn't happen, so we

¹Genentech, Inc., 1979, Corporate Plan. (Chief Financial Officer files, Genentech.) See Appendix C.

had to let her go. The first manufacturing guy turned out to be a very good guy and did a lot of other things to help the company, but he couldn't work very well outside of a big organization and really wasn't who we needed to do the manufacturing. So, yes, it was more difficult than we thought. It was never something that got to be so difficult that it caused problems, but there was a lot of energy put into scaling up the technology.

Even today one of Genentech's key strengths lies in how you scale up and manufacture these protein molecules on a large scale with different organisms. The fermentation part of it is important in terms of how to get the yields up, how to get the microorganism or in some cases mammalian tissue cells to produce large quantities of product. That has to be coordinated. And what everybody didn't think about much was the purification part. Everybody talked fermentation, but the purification was as critical and as difficult because you had to separate these small quantities of protein from all the junk. If you fermented things differently, there was different junk in there. So both of those processes had to be coordinated. If you changed the fermentation process, all of a sudden the purification process didn't work the way it worked the last time. In fact, we made the decision in the early days to put process development--both fermentation and purification--in the manufacturing building so there would be close ties between those pieces in terms of the scaling up of the process.

Hughes: You mentioned a protein chemist. Was it he that initially was saddled with the problem of purification?

Swanson: Yes, that was part of it, not only the purification but how do you formulate these proteins so they can be put into people?

Hughes: And activate them, right? Somatostatin had to be clipped in a specific way to activate it, which I suppose was not evident at first?

Swanson: Yes, just figuring out how to do that. Then different components of insulin were made in different organisms and then combined. You had the A and B chains that had to be purified separately and then combined. For that, we helped Eli Lilly, but then eventually the baton was passed, and they did a lot of the scale-up on the insulin. With growth hormone we had to do it all ourselves.

Hughes: In the case of Eli Lilly, did their long experience with fermentation help? They'd been in the insulin business for decades. But were the problems with recombinant insulin so different that they had to acquire new expertise?

Swanson: For a long time our science was leading. We laid out the basic processes for them, and then they refined them and scaled them up. It probably was the right combination for those early days because we couldn't have done it alone, and they couldn't have.

As I look at this list of things that we were working on here, we're beginning to do some marketing research on our different products. We were now working on the scale-up of insulin. We'd started work on thymosin, which never turned out to be a product. In 1979, we actually succeeded in producing human growth hormone. So that was the next product. These products came in series rather than parallel.

Introducing the Project Team System

Swanson: One of the difficult management changes came right after interferon, which was done right at the end of '79. Then we started saying, "Okay, we've gotten big enough. How do we do multiple things at once?" Then we had to develop a system of project teams, because now we were not putting the entire company's energy on one thing but rather doing a couple of things.

Hughes: Before that, certain scientists would be doing insulin and others would be doing growth hormone?

Swanson: Yes, the laboratories were. But even then the DNA synthesis group was making DNA for everybody. The protein group was helping people purify different things. So there was this integration of the different functions. It wasn't what people were used to before that, which was one lab does everything. There were really a lot of collaborations within a project.

A hundred percent of the company worked on human insulin. A hundred percent, just about, worked on human growth hormone. Then we did, in '79 I guess it was, interferon and animal growth hormone and hepatitis B. So all of a sudden we were starting to do more than one product at a time, and we needed to figure out how to create project teams. For example, there were only so many people in protein chemistry and four or five projects--all of them wanting all the people in protein chemistry. How were they to decide what to work on, and how did you coordinate all that? It was a learning process; probably it happened in 1980, more than a '79 time frame.

Hughes: You couldn't extrapolate from how the drug companies operated? I presume they also work in a compartmental fashion. You couldn't just lift that system and apply it to Genentech?

Swanson: No. It was big and bureaucratic and you didn't want to lift it.

Facilitating Corporate Communication

Swanson: I remember one of the comments at the time from somebody at Syntex--which was one of the newer pharmaceutical companies--was that occasionally the different groups which were on this big campus down there would send each other correspondence by the U.S. mail because intracompany mail took longer. They were in separate buildings, far apart. I always was very sensitive to the studies that were done about how close scientists had to be to each other to communicate. Once you get beyond--it's either seventy feet or seventy yards--communication drops in half or a quarter. People will walk one set of stairs but not two. So you start thinking about buildings either one or two or at most three stories tall, and how do you create spaces for people to gather and interact and talk, because that's where you get the great thinking that comes from that interaction.

Hughes: That was a concept that you applied when you were designing buildings?

Swanson: Our facilities, yes. We tried to think about that.

Selecting and Terminating Projects

Swanson: The other thing I see we had going there [scans corporate plan] was a vaccine for hepatitis B, which we're still getting royalties on. We were really among the first to develop that. And animal growth hormone, which we said we couldn't do ourselves because it would have been an enormous scale-up project. We finally licensed that to Monsanto.

Hughes: How did you choose these projects?

Swanson: I'm not going to give you a very coherent answer because it relied on what [molecular] structures were known. At that point, there weren't a lot of the structures known for the different proteins. So that was part of it. Where we thought there could be a good market. Where we thought it was technically feasible.

We had a whole set of criteria--speed of FDA approval; need, nothing available. In each case it was a little different.

At that time, everybody thought that interferon might be a magic bullet against cancer. Then, as you got into it, you found there are three or so broad classes of interferon. So there was a great discovery in the biology that went along with this. The molecular biologists said, "Oh, we can clone this." Well, what does it do therapeutically? In fact, today, that's really the heart of all the work that's going on. We've got the genomic work, and we're ironing out sequencing the human genome, and we're pulling out genes. But the real heart is how do they interact in the body? How do they get turned on and off? And what kind of effect do they have? Out of that will come the next generation of drugs.

Hughes: Do you think you went into it a little naively? There were criteria for starting these projects, but no real idea of what you were going to find once you really got into them.

Swanson: Yes, the body is incredibly complex. Even with the knowledge that we have today, it's not always clear. You start something, and you find out it doesn't work the way you thought it did. So, yes, I think we were naive. Interferon is an interesting example because there were new applications found for it, and today between Roche and Schering Plough I think they sell over a billion dollars worth of interferon a year. It started out with Kaposi's sarcoma,¹ and then some other applications, and it expanded from that. Eventually interferon turned out to be useful, although not as originally intended.

Hughes: Would you like to comment on thymosin as an example of a potential product that didn't pan out?

Swanson: There we had worked with a well-known professor [Allan Goldstein] on the East Coast [George Washington University] who had been working in this area for a long time and felt this was an immune stimulation agent that could have broad applications, but it just didn't work that way. In retrospect, maybe we didn't apply as stringent criteria as we could have in deciding to do thymosin versus other products because we thought, well, it's easy; let's just clone it, right? And then we'll find out. But in fact it didn't work out.

Hughes: You make it sound clear cut. I suspect in actuality it wasn't quite so clear cut. One could say, for example, all we need to do is a bit more research and maybe we can make thymosin work.

¹Thomas Kiley believes it was hairy-cell leukemia.

How do you come to the decision to cut off a project when a lot of time and money has been invested?

Swanson: That's one of the most difficult things to do. One of the reasons companies succeed or fail is which projects get cut and which ones don't. Even in the case of tissue plasminogen activator to treat heart attacks, other people had looked at this and didn't see it as something that could be used in the way we did it. So it's a judgement call, and that's where you need the very top scientists and medical doctors and everybody to make that call--when to stop it, when is enough, and when to go the next round.

A "Loose-Tight" Organization

Hughes: In a situation such as that, would you have put a lot of priority on scientific advice?

Swanson: Oh, yes.

Hughes: I'm trying to make it too clear-cut, I'm sure, but the science drives the business, doesn't it?

Swanson: The science drove the business from the very beginning. People talk about a "loose-tight organization." What they mean is, at an individual level of the scientist and the technician, you want a lot of flexibility for them to do the projects that they're working on and to follow their nose. But as the effort gets greater, all of a sudden it's not just a couple of people in the lab; it's people from other groups working together, and there's more money involved. Then the criteria need to get tighter and tighter as the number of people involved and the money you're spending increases. You need to make sure, "Okay, are we thinking about this correctly? Have we analyzed it? What success do we need before we make the next investment?" So where you have a lot of flexibility at the small end, as a project gets further along, you have to become more rigid in terms of making sure you've hit the milestones before you make another investment.

Swanson Keeping in Touch

Hughes: You describe an organization that within three years of formation is already getting fairly complex. How did you keep track?

Swanson: I walked around a lot. I'd be walking through the labs and talking to people, and I think they really appreciated it. I did it because I was interested. They knew that I loved the science and thought, "Oh wow! I got this great result. I'd better go tell Bob," because I was as excited as they were about it. In the early days, you could do that. But as organizations grow, you can't do it as much so you have to figure out other ways of doing things.

Hughes: What sorts of ways did you use?

Swanson: Well, you have team meetings. You have to do it, but the other way is better.

[Swanson again scans 1979 Corporate Plan] I've just been looking at who we had on board here.

Hughes: That's an interesting document, isn't it? It lays out what Genentech was doing and who was there.

Swanson: So Ullrich hadn't come yet. Seeburg was here and Giuseppe Miozzari.

Hughes: Who is he?

Swanson: He was a Swiss fellow, and he only stayed two years, so it must have been '79 and '80. His wife wanted to go back to Switzerland. So he's been working for Sandoz for a while.¹ He was an early molecular biologist.

Clear Corporate Goals

Swanson: Here we had clear goals in each of these areas, as you look through the corporate plan. We said we wanted to have hepatitis surface antigen expressed by January 1980. We wanted to have interferon monoclonal antibodies by November of '79. What we tried to do as a company was to say, "Okay, what are the most important things to get done, and who's going to be in charge of them?" And to lay those out. We had to figure out a way to put the insulin A chain and B chain together by June 25th of 1979. [laughs] We'd try to make the goals realistic, and scientists always added extra time because they would give us their best estimate. Things would always slip a little bit, and we'd try to

¹Miozzari went to Ciba Geigy, which later merged with Sandoz to form Novartis. (TDK)

make this realistic, but you had to deliver on this. [reading from corporate plan] "To develop a procedure for purifying the following proteins from *E. coli* cell paste."¹ So there it was; there was a list of goals and a group of people working on how to get that protein out of the dead *E. coli* cells after they'd been fermented.

Hughes: This must have been very difficult to figure out when you were breaking new ground in many of these areas.

Swanson: Yes, this was not anything that had been done before. Then we had a bunch of potential products that we were looking at. [reading from corporate plan:] "In order to obtain a better understanding of organization and function of eukaryotic genes and to isolate DNA sequences coding for valuable proteins, the following project is initiated..."² We had looked at beta endorphin and nerve growth hormone and secretin and IGF [insulin-like growth factor] 1 and 2, and a number of other things that we were just beginning to look at to say, okay, could these be interesting products? Actually, IGF 1, which is first talked about here in '79 as an interesting research product, is now in tests by Genentech for treatment, with growth hormone, of peripheral neuropathies.

Hughes: But it was not pursued further in 1979?

Swanson: There was only so much we could do. The same thing is going to be the issue today: what are all these genes and everything people discover good for? How can you make a drug out of them? The knowledge is expanding, but that last step, how could this be useful, is really the key. Sometimes it takes a long time. Look at those two, IGF 1 and nerve growth hormone. It just took a long time to figure out how to use them and to what disease they might be applicable.

The Need for Basic Biological Understanding

Hughes: In attempting to develop biological factors as commercial products, companies sometimes ran up against a lack of knowledge of immunology. Even today, there is that problem.

¹The proteins listed are insulin, somatostatin, human growth hormone, and alpha-thymosin. (Genentech, Inc., 1979 Corporate Plan, Chief Financial Officer files, Genentech.)

²Ibid.

- Swanson: Yes, and there was much less knowledge then. So I think this is still going to be where the rubber meets the road.
- Hughes: In those early days was there a euphoria because of the technology? "Look, we've cloned all these genes. We have the golden key now. The products are going to flow." It was not that simple.
- Swanson: It wasn't, no. And today you look at all the genomics companies. Several have funding of sixty, seventy million dollars over five years from giant pharmaceutical companies to find genes in the area of obesity. I think good work and great science will be done, but there's a lot of work from finding the first genes to understanding how you can make a drug to make those fat cells shrink. [laughter] Whatever the goal is. The technology itself creates euphoria because you've now got the tools to really analyze these things. But the body is a complex system with lots of interactions, and how you can affect one thing without affecting a bunch of others--which is what side effects are all about--is why it's so difficult.
- Hughes: Did you, in those early days, appreciate that high technology wasn't enough in itself, that you had to have the science?
- Swanson: Yes. Initially, I didn't work on things when I didn't know how they worked. Insulin I knew; growth hormone I knew. I took my first risk with interferon, where we didn't know how that worked. People had been working with tiny quantities of it, and they had all these different results--some exciting and some not. But that was a real risk.

More on Choosing Projects

- Swanson: [referring to corporate plan] Some of this next group of biological factors that has taken a long time to figure out were more risky than the first. We chose to develop the others first because at this early stage we couldn't afford to take any of those risks. If we succeeded in making these products, we had to know that they would work in humans. We were pretty sure that human insulin would work just as well or better than pig insulin. Growth hormone had been given for many years, but it had been extracted from cadavers. And now that we were making it in *E. coli*, it should work the same way.
- Hughes: Being the first successful biotech company, did Genentech have an advantage in being able to skim the cream? To take the obvious projects and drive them to a product? Or was there so much out

there to develop that other early companies didn't have to worry that Genentech had taken the easy projects?

Swanson: Well, I think I was kind of unique in thinking about growth hormone being easy. Because when other people talked about this technology, insulin was always mentioned, but there wasn't a lot of excitement about growth hormone. It was then kind of a tiny market.

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Swanson: While in retrospect they look like, "Well, you picked the easy ones," I'm not sure the idea of going for them was an obvious decision. In retrospect, you obviously go for the ones that have an existing market. But people weren't thinking like that. The scientists and other business people were talking about going for products where there wasn't an existing market. In theory, you could cure cancer, or you could do this or that, and if you could that would be great. But it was certainly more risky because you didn't understand the biology the same way that you understood the potential market. So what seems like an obvious decision today, wasn't as obvious to everybody at that time.

The other thing I guess you're asking is, did we have an advantage? I think we did because we were early enough, we had built up a strong team, and some of the other people that came after us wouldn't work on things that we were working on because they were afraid to compete with us.

Goal to Remain an Independent Company

Hughes: You were reported in the *Examiner* in 1980 as stating that Genentech's corporate mission was to remain under the control of its management.¹ Was there some threat at that point? Why did you make that comment?

Swanson: I don't remember that comment. The mission, as I look at it here, states: "Genentech is a privately financed high technology corporation owned by management and venture capital investors. Its purpose is to commercialize and bring to the public the benefits of new molecular biological technology."² In other

¹Mike Johnson, "Behind Genentech's Decision To Go Public," *San Francisco Examiner*, August 20, 1980.

²Genentech, Inc., 1979 Corporate Plan. (Chief Financial Officer files, Genentech).

words, what we're saying is that this is an independent company. You have investors and you have management, and we're running it; we're in control of it. This evolved to another mission statement, which was to build a major independent pharmaceutical company. Well, that changed with Roche's involvement in 1990. But up until that time, that we'd stay independent continued to be the goal.

Hughes: There were never reasons before the Roche acquisition to question that?

Swanson: No. The idea was we weren't building up something to sell to somebody else. We weren't in the business of just collecting royalties and doing research.

Early Strategy to Cover Operating Expenses

Hughes: According to the 1981 annual report, Genentech's early strategy was to cover operating expenses with contract revenues and interest income. Do you want to comment?

Swanson: Yes. It was a very important part of our strategy. We had to build up an infrastructure that would allow us to work on these different projects, but since there was a long time between when you first cloned a gene and when it became a product that was being sold and generating revenues, you had to figure out how to feed all the people that were working there. I was very concerned about two things. One was running out of money at an inopportune time, because sometimes it's easy to raise money and sometimes it's hard, and it's totally independent of when you need it. Second, I was concerned because I'd seen as a venture capitalist some companies in the development stage develop this psychology that, "Well, it's okay to lose money. Next year we're going to turn around." It was not a good way. So I said to the scientists, "Look, a company has to make money."

I don't know if you saw that little brochure, "The Genentech Corporate Philosophy." There are seven points. The first one is profitable growth. It was the base, the essence of it. I would take new employees, many of them coming out of the academic world, through this philosophy. I would say, "Why do we have to be profitable? It's a measure of the health of a company because it says, How well do I understand what my customers' needs are? Can I make a product that they want to buy? And will they pay me more for that product than it costs me to make it? And if I can understand their needs well and make a product for less than they're willing to pay for it, I get to keep the difference."

There's overhead and other things, but I said, "This is the essence of a company." The better you understand customers' needs, the cheaper you can make the product, the more value the product has that they're willing to buy. Then you make more money, and the more money you make, the more it says, "I'm doing things right. I'm a healthy company."

So that was an important part, and I would introduce the scientists to that concept, many of whom had grown up thinking profits somehow were evil. So the first thing was that it was important not to lose money, and second, that it was important from the psychological standpoint of the people working at the company. If we were to break even during these development years when we needed to expand to put in a new plant or new laboratories, if the timing was right we could raise the money to do that, and we wouldn't be at the mercy of the venture capitalists or the markets and get caught without funding. It was trying to manage it conservatively.

Licensing and Selling Product Rights

Hughes: Well, I read that as early as '79 you squeezed out a paper profit.

Swanson: Oh?

Hughes: Yes.

Swanson: Well, it wasn't very much; it was maybe a penny per share or something. But the whole idea was that we would try and break even during this time. Actually, it was very, very helpful because it focused our energies on, "Okay, what are we going to work on that we can get to be a product? And then, how do we structure the business so that we can get other companies to help us fund this development?"

We eventually evolved to a strategy which we jokingly called, "Let's sell something three times." We would try and license rights to a product to Japan, where we knew we couldn't sell ourselves for a long time. We'd try and license rights to Europe, where we thought we wouldn't be able to sell for a long time. And we'd keep the rights in the United States for the product and try and do an R&D partnership to fund the development. This is where investors would actually buy it, own it, fund the development of it, with the right of the company to

buy it back and pay them a royalty.¹ So they got the tax benefits.² If it didn't work they lost their money, but if it did work, they could get a substantial return. In all, the investors made money in those partnerships.³ In fact, one of the things I'm proudest of is that every time the company went out to raise money, the investors made money. You couldn't control the trading of the stock--people buying and selling. But when we went out to raise money, whether it was selling stock or selling bonds, everybody has made money when they bought directly from the company. That is something I'm pretty proud of.

Hughes: George Rathmann commented that Genentech raised tens of millions of dollars selling certain product rights in Japan and Europe. I don't know what period he was referring to.

Swanson: I don't know exactly, but that was the whole strategy. Eighty-five percent of the total world pharmaceutical market is Japan, U. S., and Europe. It's divided a third, a third, a third--a little less in Japan, a little more in Europe, but roughly that way. So we thought about it, and we said, "Okay, we can only do so many transactions because it takes an incredible amount of energy to do a licensing deal. So if we think of things in thirds, we can capture 80 percent of the value. We're not going to be able to market in Japan for a while, so we're really not giving up very much. Europe would be easier, but let's try and keep the U.S. rights. So we then used these different financing vehicles to try and cover our expenses while we were building the company--while we were pushing these products to the market.

Hughes: You couldn't market in Japan because of drug approval problems?

Swanson: Well, you'd want to market in the United States yourself, because you understand it; and Japan generally took longer to get approval. They weren't so concerned about whether a drug worked, but they were crazy about safety. So they'd do years and years of safety study and very little looking at whether it was effective or not. But it was a different culture; you'd have to set up a whole different approval process; drugs generally got approved later; it was dominated by Japanese firms. So that's not the first place you'd want to go.

Hughes: I saw a reference to a meeting in 1979 in which you participated. Nelson Schneider, a pharmaceuticals analyst at E. F. Hutton, held a conference with you, Peter Farley of Cetus, Phillip Sharp of

¹Or in the earliest R&D partnerships, the choice of royalty or stock valued at a multiple of their investment. (TDK)

²R&D credit. (TDK)

³Almost all the partnerships were successful. (TDK)

Biogen, Leslie Glick of Genex, and Zolt Harsanyi, a researcher doing a report on genetic engineering for the Office of Technology Assessment. Do you remember that meeting?

Swanson: I remember. When you say the names, they all come rushing back; but I don't remember the content. But they were the players.

Hughes: I guess Amgen had not yet been founded.

Swanson: Well, maybe it was being formed. I don't remember exactly when it got started.

Early Political and Financial Issues

Hughes: Legislation to regulate recombinant DNA research, which actually never came to be, was being argued at the federal and state levels in 1978-1979.

Swanson: Boyer and I went back to Washington; we set up meetings with different congressmen. I remember seeing Senator [Edward] Kennedy and others, trying to convince them that the U. S. should use the guidelines rather than legislate. In the end we were successful in doing that, but it was touch and go. So there was a lot of interest in whether recombinant DNA research needed to be regulated in terms of its safety. The other side--to balance it off--was the vast potential to do good. The Congressional Office of Technology Assessment and others were looking at, okay, what are all the benefits that could come out of this technology so that you can make a good decision about it?¹

Hughes: And that's one reason that Philip Handler's announcement in a Senate subcommittee of the cloning of somatostatin was a big deal. Here was evidence that biotechnology was a promising industry of potential value to the American economy.

Swanson: Yes.

Hughes: Which was a theoretical argument at that point. I guess people would argue it's still theoretical. [laughter]

Swanson: Well, no, I don't think they can. You look at last year: the products that came out of Genentech's laboratories--they were

¹See, "Impacts of Applied Genetics: Micro-organisms, Plants, and Animals," Office of Technology Assessment, Congress of the United States, Washington, D.C., 1981.

created there but not all of them sold by Genentech--total annual sales were over three billion dollars. That's products that people are buying and using. That's pretty incredible. Still, people always say it should be happening faster, and you'd like it to but it's tough.

Hughes: Did you have a concept, as you were beginning all this, of the time lag between the scientific idea and an actual product?

Swanson: We did estimates. We always picked times that turned out to be a little shorter than the time things actually took to get done. But, yes, clearly, we understood at the very beginning, and that was part of this financing strategy, that we can't predict how long it's going to take so we have to cover our expenses as we go along; we have to have a way of doing that because it may take longer than we think, and we can't put the survival of the company in jeopardy.

Initial Public Offering, October 14, 1980

Hughes: Would you like to talk about the IPO?

Swanson: Sure. We decided to raise money in our initial public offering in 1980. We did it for a number of reasons. One is that we needed more money to complete our development. There was a lot of excitement about the technology, and we wanted to be the first company out to the public market because we felt that we were doing things right. We were basically managing the business conservatively; we were focused on getting to market; and we wanted to set the right tone--the idea being, if a bunch of other biotechnology companies were out there, and they disappointed investors or they weren't doing things right, then it would be more difficult for us. So we wanted to set the standard. We had been setting the standard on the science. We wanted to set the standard as a public company.

Hughes: Were some of your competitors, mainly Amgen and Biogen, thinking along these lines?

Swanson: No. There was "the Big Four." It was Genentech and Cetus; Biogen was just started, and there was a Genetic-something in the Washington, D.C., area.¹ They were focused on industrial products. We felt that we needed to set the standard, and so we made a decision to take the company public. The most interesting

¹It was Genex Corporation. (TDK)

fact is that raising thirty-five million dollars was the largest initial public offering ever done to that point.

Hughes: Across the board?

Swanson: Anywhere. Now they're doing billions of dollars, but at that time it was the largest IPO ever.

Hughes: Why would that be?

Swanson: Everything was done in smaller amounts. At that point the Kleiner & Perkins venture capital fund was eight million dollars. Today it's three hundred million.

Hughes: What I meant was, why did Genentech capture the imagination of the investment world?

Swanson: Well, it did that because it went from thirty-five dollars per share to eighty-nine the first day. I think people saw these new tools [recombinant DNA technology] for what they were. It was ability for the first time to have the tools to understand the human body and begin making drugs to cure diseases. It was a kind of technology that can capture people's imaginations. You had people say, "Well, we'll put this stock in the drawer for our grandkids. This is something for the future." So a lot of excitement happened in those days.

The Economic and Political Environment

Hughes: I'm wondering if the larger economic environment didn't play a role as well. In 1980 the Supreme Court made a decision in *Diamond v. Chakrabarty* that living organisms are potentially patentable. In that same year the Bayh-Dole Act gave universities the right to patent federally funded research. I'm surmising that the economic climate must have been conducive to the IPO. Do you want to comment on the larger context of the IPO?

Swanson: I don't remember what the economy was doing at that time.

Hughes: It wasn't a factor in your thinking?

Swanson: No. The factor was, is the market doing well enough and interested in this sort of thing? Because sometimes the stock market is interested in new technology, and other times they're running for cover and buying bonds. So it had to be an environment where, independent of what the economy was doing, the

market was ready for a risky, small company and people wanted to invest in the theory that maybe we'd do well and they'd do well.

Hughes: I'm assuming that there was a road show connected to the IPO?

Swanson: Right.

Hughes: Can you tell me about that and who participated?

Swanson: Oh, it was great. There turned out to be so much excitement about this that people were publishing articles in the newspaper. We really had nothing to do with it, but the SEC [Securities Exchange Commission] was concerned that there was too much publicity. So they wound up delaying the public offering to let things cool down. Well, it turned out that I was about to get married. The plan was to have the road show and the public offering done and then to get married. We actually had a small ceremony in Florida because my grandmother was 92 and couldn't travel. But with the delay, the road show and everything came after the wedding, and we couldn't change the time we got married.

So my wife, Judy, and I got married in Florida on September 2nd of 1980, a Thursday, I think. We had a weekend together in Paris, and then we were joined by seven men for the road show through Europe. [laughter] It was Snow White and the seven dwarves going through Europe. We did two cities a day. From Tuesday through Friday we did Paris, Geneva, Zurich, Edinburgh, Glasgow, London. We'd arrive and we'd tell my wife, "We'll be back in two hours and we'll go to the next place. Have fun looking around." Of course, we were always late. She was very understanding. That weekend there was the old Leeds Castle just south of London, which was dedicated by the Whitney family for medical conferences and things like that. So we were able to stay in the castle that weekend, along with the rest of this contingent.

I left my poor wife on her own at Heathrow [Airport, London] with a rented car and said, "Drive into the countryside. You're going to love the Lake District. I'll be back in a week." [laughter] So she drove through the countryside. People asked, "What's a nice American girl like you doing alone?" She said, "Well, I'm on my honeymoon." Of course, that drove them completely crazy. Then the next week I did the U.S., which was Boston, New York, Minneapolis, Chicago, L.A., San Francisco. Then I flew back home, and Judy says I slept for three days. But then we had the remaining three weeks to have our honeymoon and come back and work.

Hughes: How did you choose locations for presentations?

Swanson: There are institutions, both in the U.S. and in Europe, that invest in new public stocks. So what you have to do is go around and tell them your story, explain to them why they should invest in you. A day would be a breakfast meeting and maybe a couple of one-on-ones. Say, you'd go in and see institution one and make a presentation to them, and then you'd leave and go to another one and make a presentation. Then you'd make a big luncheon presentation to lots of people who were interested and maybe a couple more in the afternoon and at dinner. This is a grueling, grueling time. You just come back like a wet dishrag. Even though there was a lot of enthusiasm, this was a tiny company and the biggest public offering, and we didn't know that we could sell it.

Explaining Recombinant DNA Science

Hughes: It also involved a science that most people wouldn't be familiar with.

Swanson: We had little beads, like baby beads, to make plasmids from. So we made a circle and we'd pop it open and pop the gene in and pop it closed. Actually, we stuffed it into a box that represented *E. coli*, [laughter] trying to get people to conceptualize what it was that we were doing.

Hughes: Who was along on these tours?

Swanson: Well, Herb Boyer and myself; Tom Perkins, who was a chairman of the board at that time; a venture capital investor, Bill Hambrecht of Hambrecht & Quist; Pat McBane, who was in charge of corporate finance at Hambrecht and Quist, and Bud Coyle of Paine Webber--

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Swanson: --were hopping around all over the place! [laughter]

Hughes: These people were leaders of the venture capital world?

Swanson: Well, these were not venture capitalists per se but institutional investors. So they would be managing pension money; they would be managing insurance funds, and so on. Actually, some of them had a long tradition. You go to Edinburgh; they have a Scottish Trust, which has this tradition of investing in new technology. They were able to help build the railroads in the United States

because they could get 5 percent by lending to the railroads, and only three percent in Europe at the time. They helped finance the development of railroads when they were a new technology. So you always make a stop in Edinburgh to visit the Scottish Trust because, as they say, "We're not near any financial markets, so we don't get caught up in the day-to-day, but we can say, 'Ah, this is an important trend. This is a good company over the long trend.'"

Hughes: What was your reception?

Swanson: I think it was enthusiastic.

Hughes: Does the media come into this? Were stories appearing as you were doing the road tour?

Swanson: Well, no. Once you register with the SEC, there are very strict controls over your ability to promote the stock. So we hadn't gone out and talked to any media, but they just picked up the stories. We were very careful we didn't do any of that, but they got wind of it and started writing. So that was what caused the delay in the offer.

Valuation

Hughes: How was the initial share price of thirty-five dollars established?

Swanson: It was basically a negotiation between me and the underwriters, between the company and the underwriters.

Hughes: How could you value a company such as Genentech which had no comparison and no products?

Swanson: Well, I guess the last private round of financing had been done by Lubrizol at about a sixty-six million dollar valuation. The public offering was done at about a two hundred seventy million, two hundred fifty-six--I don't know--million dollar market valuation.¹ The bottom line answer is: market forces, more than anything else. Obviously the people are investing in the hope that the company will go up. In the long run, it's can this company earn sufficient revenues to make the value of it go up from when I bought it? Then there are the traders, right, who think, "Well, this is a hot stock, so I'll buy now, and when it

¹Valuation was approximately \$233,000,000. (TDK)

goes up I'll sell." People made a lot of money. They bought it at thirty-five and sold it the same day.

Hughes: What did your scientists say about Genentech becoming a public company?

Swanson: I remember one article that sort of says it all. Richard Scheller was a postdoc in Itakura's lab at Caltech. He's now a professor at Stanford.¹ There was a big article about him in the *Los Angeles Times* around the time of the public offering. I gave him, early on, fifteen hundred shares or something, which later split and split and split. He was now, at the public offering, worth a million dollars. So all of the sudden this became the story, how a postdoc became a millionaire. [laughter] So some of the scientists were saying: "Well, my goodness, this stock is worth real money now." And half of them didn't believe it right away. It took a while to sink in, but it didn't change people's behavior very much. It was just, "What's next?"

Hughes: What about being a target of market forces? You have shareholders; you've got to keep the share price up; you've got to get products out--not that you didn't before--but now there's a level of scrutiny that didn't exist before the IPO.

Swanson: You can see the price reflected every day. The value could go up or down before, but you didn't have to look at it every day. [laughter] So that's the biggest difference. And you had to be careful that you told everybody the same message because you couldn't have people having insider information. So when you announced things, you had to be thoughtful about, was this an important announcement to make? Sometimes the lawyers would say, "You have to make it," and you didn't want to make it. You had to because you wanted to--² We tied that to scientists' desire to publish, which we continued to do on a regular basis all through this, which made it a little bit easier. Because as soon as we had the patents filed, as soon as we had the manuscript, usually it was published. We made the lawyers file the patents when the papers were being written so that they were the ones who made sure the patent applications got done. So we continued to

¹In March 2001, Dr. Scheller became Genentech's Senior Vice President of Research. ROHO interviews are in progress with Dr. Scheller.

²It's not clear what Bob intended here, but he's probably making the point a public company must be consistent in its announcements. If it announces good news concerning a particular subject it may have made that subject material, though it might not otherwise have been regarded so. If the subject has been made material, the company may be obliged later to announce any bad news concerning it. (TDK)

publish, but then there were public announcements that had to come out of that.

The world was a little different then, although it wasn't a big difference. It wasn't until years later in the late eighties with some dramatic drop in the stock price that you had the issue of people thinking, "Well, gee, I had a lot more money than I do now."¹

Hughes: Do you think the scientists felt more pressure once Genentech became a publicly held company?

Swanson: I don't think so. I didn't see that as having a big impact. It would be interesting if you talked to them. Maybe they have a different viewpoint.

Benchmark Payments

Swanson: The thing that made the biggest difference in those early days was that in each of these agreements we set up with these licenses in Japan and Europe we had big benchmark payments. We said, "Look, maybe we haven't even cloned this product. Or maybe we've just cloned it, and we haven't scaled it up. But we think it's really valuable. We need some money now, but you shouldn't have to pay it all until we've taken out some of the risk. As the product gets closer to the marketplace and becomes more real and less risky, then it's worth a lot of money and you [must] pay us as you go." So there were benchmarks in terms of agreements that we signed, say with a Japanese company, that would be so much money on signing, maybe a million or two dollars to show their commitment to the project. Then when we had cloned the product, maybe there was another two or three million. Then maybe when we had scaled it up and were able to produce ten grams of material, there was another two. When we had got it into clinical trials, maybe another payment. The total could be fairly large in terms of the dollars, but you didn't get them all until the risk was taken out.

Why that was important from the scientists' standpoint was the scientists were the people generating the revenue, because when we achieved these benchmarks the company got revenue. And we would try like crazy to get the revenue in a particular

¹Clearly, Bob was referring here to the phenomenon that later became common in which class action strike lawyers would often sue after any precipitous drop in share price. (TDK)

quarter so we wouldn't lose money. So that's what changed. Before we had deadlines, like June 25th. Well, all of a sudden June 25th became more important because June 30th was the end of the second quarter, and if you got a million dollars the second quarter, you'd break even for that quarter, and if you didn't, you'd lose money. So there was a new element there. The most important thing for the scientists was: they were part of the strategy of where the company was going, and they were part of generating the revenue. So never in the life of the company had there been greater integration between business and science, and all the goals and benchmarks were chosen to move the product quickly to the marketplace. We only picked benchmarks that would help us focus on doing those things we needed to have done in order to get this product through the FDA and approved. So it drove us; we used the market forces to drive and focus the company on doing those things that it most needed to do to get the products approved.

Hughes: Did the benchmark structure originate with you?

Swanson: Yes.

Hughes: It is now pervasive in the industry?

Swanson: Pervasive, yes. Yes, we started that.

SEC Procedures

Hughes: I understand from an article in *Nature* that Genentech's public offering was held up a few days because the SEC wanted more details about the company's operations to be made public.¹ Do you remember that?

Swanson: It was probably pretty standard. Usually, you submit an S-1 [form]--we have one right here--and they ask you a few questions. Sometimes they don't review you, sometimes they do. But there wasn't anything unusual about that. I think it was all the excitement and, "Well, we'd better look at this one because look at all the publicity that's going on."

¹David Dickson, "Genentech Makes Splash on Wall Street," *Nature* 287, no. 5784 (1980): 669-70.

Hughes: Your prospectus warns that your stock "involves a HIGH DEGREE OF RISK."¹ Did you expect that?

Swanson: Oh, yes. This is pretty standard for all these things. In fact, every prospectus you see today has this big risk section. It has to be there for the lawyers, more than anything else, so that you have said to everybody, "This is very risky." Most of the investors don't read it. But the prospectus tells you, the company isn't selling a product today; there's no guarantee that it will ever have a product. It relies on key individuals, and they may leave the company. All the bad things that could happen have to be outlined in these prospectuses, and it's a standard thing for all the different kinds of companies.

Hughes: Do you have anything more to say on the subject of the IPO?

Swanson: Well, you had asked, how do you do the pricing? Well, one of the things you could say, "Well, gee, if the stock went up and ended at 79,² and we sold a little over a million shares, so that every point increase would have been an extra million dollars in our bank, didn't you screw up, Swanson, by not pricing it higher?" Maybe it could have been priced a little higher, but two or three months later, it kind of settled into the low forties, so that people who bought at thirty-five had 20 percent gain on their money. They had made money, and all that speculative fever had gone away, and the share price stayed there.³ So maybe we could have gone a little bit higher, but I think the goal of trying to make sure that the investors made money was probably worthwhile, and we got a lot of publicity that was probably worth much more than what we gave up. So in the long run it probably was a positive thing.

Corporate Culture and Strategy

[Interview 5: February 19, 1997] ##

Hughes: I'd like to start with a quote from George Rathmann: "For a biotechnology company, strategy probably means primarily the

¹Genentech, Inc., Securities and Exchange Commission, Washington, D.C., Form S-1, October 14, 1980.

²After going higher, the share closed at \$71.25 on the day of the initial offering. (TDK)

³In fact, in a few months and for a few days the stock drifted under the offering price, which reinforces Bob's point of conservatism in pricing. (TDK)

establishment of a corporate culture or character." The emphasis that he put on the importance of corporate culture surprised me. Would you like to comment?

Swanson: I think that culture and strategy are related but different. The culture is so critical to achieving the strategy. What we tried to do in the early days of Genentech, and I think by and large succeeded at, was to create a culture where anything was possible. We believed in ourselves and that we could do it. We set high goals, and we'd strive mightily to achieve them. We tried to hire the very best people. We gave them a lot of freedom and ability to achieve the goals, the flexibility for them to help in the goal-setting process, and once the goals were set, for them to figure out the best way to get there on their own or with their team. So that was very critical to the goal, which I would say is strategic, to build a fully integrated pharmaceutical company. We wanted eventually to make and sell products and not just be a research company. I'd say that was the broad overall goal, but the ability to achieve that I guess was related to culture. In fact, some people characterized our goals as arrogant. "How could you ever believe that you could achieve these things?" And it wasn't that at all. It was, "Well, if we don't try, then we never will." And we wanted to build a pharmaceutical company where no one had succeeded since Syntex in the early fifties; it was that difficult. So having the kind of culture that embraced that was critical.

Hughes: How would you describe that early culture?

Swanson: Well, I think just a "can-do" attitude.

Hughes: What kind of atmosphere did a person find when he or she came to work at Genentech?

Swanson: There was a lot of excitement about the science, a lot of young, bright people all working on the same goals. Maybe Dave Goeddel captured the essence of it best.¹ As a hobby prior to joining Genentech, he was a rock climber. Most of his friends have since died in this sport, but he was a world-class rock climber. Their whole attitude was to go up or to die. One of the first, most successful, and still popular Genentech T-shirts--we had T-shirts for events--is a black T-shirt with a red oval and a Harley Davidson set of wings and some DNA symbols. Underneath it says, "Clone or die." I think that represented the approach: we're going to win. We're going to succeed. There were people working around the clock, whatever we were doing--competing with Wally

¹Dr. Goeddel talks about his approach to research at Genentech in ROHO interviews currently in progress.

Gilbert to clone insulin, a Nobel Prize winner at Harvard. Whatever it was, well, we were going to do it, and we did.

We had established the ho-ho's to relax on Friday afternoons, which were sort of an extension of what was done at UC San Francisco where there were wine and cheese parties. But at Genentech it really took on more of a meaning, okay, here is a place of equals doing different jobs. There wasn't management on the one hand and science on the other. There was, okay, we need to take care of the business part of this; we need to take care of the science part of this; and we're all in it together. So ho-ho's were a way that people could get together in their shirt sleeves and relax at the end of the week but wind up talking ideas about how to do things better. Everybody was in their shirt sleeves and no feeling of management about the place.

Hughes: Is youth a factor, too? You were of a generation.

Swanson: Yes. I was a young entrepreneur, and the science was so young that most of the best scientists were newly trained, and certainly they were the only ones willing to go to industry in those days.

Hughes: It seems to be a very unhierarchical structure that you're describing, in contrast to the university setting where you have the professor as head of the lab.

Swanson: It was very conscious. And this is where Herb's and my philosophy--he coming from the science, and I coming from the business side--meshed almost exactly. He didn't put his name on the insulin paper because he said, "Well, here are the people that did the work. They should get the credit--the young post-docs." That's unheard of in the academic world. And I had the same idea from the business side, which is, you give credit to the people doing the work and give them the freedom to make the decisions and make it happen.

Employees as Shareholders

Hughes: Were there financial bonuses in the early days, above and beyond salaries?

Swanson: The philosophy was everybody was a shareholder--everybody from the person washing the glassware to the president--because I had the idea that if you looked at this company as an owner, then you'd make the right decisions. You didn't need a thick policy manual or anything. You needed a few guidelines about the way

the company wants to be. And the idea that, well, okay, if I owned a hundred percent of this company, what decision would I make in this case? Almost always you'll make the right decision. Obviously, everybody can't own a hundred percent; but if everybody owns shares and they make a decision--not as an employee but as an owner--then it would work. That equality of people doing different jobs, all with the same goals, was something that we tried to foster, and I think was important.

Practical Jokes

Hughes: Another facet of corporate culture was the tradition of practical jokes.

Swanson: You know, in working that hard, you have to let off steam some way. In the hallways, there would be Nerf ball games, with the little tiny basketball hoop and the little Nerf ball, and people would be playing little games for dollars or something.¹ It was a way of letting off steam. Some of the ho-ho's were very creative in the sense that there were costumes at Halloween and there were parties--irreverent in a way, which was good. The scientists sponsored a ho-ho where they had a bunch of Calaveras jumping frogs that they named after the board of directors. [laughter] I was a little green frog. It was called the French ho-ho. They had a big circle in the cafeteria with the Eiffel Tower and a box with all these frogs in it. Then they released the frogs to see which one would get out of Paris first, out of this circle. People were rooting for their favorite member of the board to hop out of the circle. [laughter]

Then there were little jokes. Tom Kiley was giving one of the technicians a hard time,² and the technician decided to get back at him. He took a tiny speck of radioactivity and taped it to the end of a Geiger counter. He could secretly turn up the volume and get it to really click like crazy. Tom Kiley was the general counsel at the time. The technician came into his office and said, "Well, I was eating lunch in here last night, working late, and I spilled my experiment all over your seat. I just wanted to let you know. I was a little worried about it, but I

¹Bowling for dollars, which after the IPO replaced pitching pennies. The wall target was the same but the stakes were different. (TDK)

²TDK (editorial license): At the insistence of the molecular biology group I merely upbraided the technician, a new employee, saying his football pool put the pending IPO at risk. He was unaware the conversation was being broadcast to group members waiting outside my office door.

checked it. It's not too bad." He went over and put the Geiger counter right where Tom was sitting and cranked up the volume. It went "zzzzzzz." The technician said, "Oh, my God. I must have spilled more than I thought." He held it up to Tom's crotch and did the same thing, and of course Tom went completely crazy. He had him going for about half an hour like this. [laughter] But it was those kinds of things that went on that helped relieve the tension and made it fun.

Hughes: It also created bonds, don't you think? This was more than just a job.

Swanson: Yes. This was a grand experiment in, Can we do this? We're all in it together. Can we achieve it? Yes, working together.

Hughes: It wasn't just, can we produce insulin? Or, can we produce growth hormone? But can this industry really take off? I mean, something bigger than Genentech. Was that a consciousness?

Swanson: Yes. We knew that we were the leading company, and the one that was going to create this industry if it ever got created, and that was part of it. But it was more, can we create a different kind of company, and at the same time make products to cure disease? You have to admit that this business is more fun and rewarding when it works than making hula hoops or something, because, geez, you cure disease. And can we do that and at the same time build a different kind of company, a company that's modeled along the kind of philosophy that we have been talking about? I think everybody was very much a part of that, and the camaraderie and the comfort of the interaction between people in the different walks of business was an important part of it.

An Integrated Egalitarian Company

Hughes: Well, you've talked all the way through these interviews of your early goal of creating an integrated pharmaceutical company, and yet my image of a pharmaceutical house is quite different than that of a biotechnology company. Did you mean a pharmaceutical house in terms of the functions that would occur in Genentech but within the different culture that you've been describing?

Swanson: Right. We weren't trying to be a Merck or a Lilly. We were trying to be a different kind of company, but we needed in the long run to be able to make our products and sell them ourselves. So that was always the goal. We used different production processes to make our products. But we still made them, and there were factories at Lilly and factories at Genentech. So

those things were similar. But in order to control our destiny, we had to sell our own products.

Hughes: As you became more successful and grew, the culture associated with the small start-up biotech company must have changed. What has that meant to Genentech, and what does it mean now, particularly in this atmosphere in the 1990s of partnerships and strategic alliances?

Swanson: Well, as a company gets bigger, it gets more difficult to do a lot of these things. So as we were growing, we worked very hard at trying to think of new ways to do things that would keep the culture alive and well, but would take into account that there were many more people. As an example, in the early days an individual might be responsible for doing one of the ho-ho's on Friday, and then it became a competition between departments. The financial department might do it one week, and then manufacturing, and eventually it was the protein scale-up party. You were trying to think of ways to keep the excitement alive, the we-can-do-it attitude and the equality.

There were little things, like there were no reserved parking places. You got in early or you walked a longer distance. That went for everybody. And we tried to take the energy out of the offices issue in the sense that offices were pretty standard. People can spend a lot of time thinking about who has a bigger office or who has the corner office. So we tried to take the energy out of that as best we could, even as we got bigger, because you want worrying about, how do we get the product out, rather than, am I a little junior or senior to so-and-so based on different office size? Status came from what you contributed to the success of the organization, not the peripheral stuff.

Hughes: What I think you're saying is that you were trying to create a better company internally. An argument could be made that you need an impressive office for your top administrators to impress the outside world, particularly the financial world.

Swanson: We didn't really worry about that. The culture things that I talked about--and I think you've said it better than I--were all done for the main purpose that we thought we would have, if we did these things, a better, more productive company that would be more successful and continue to be a place, as I used to say and still do, where people enjoyed going to work every day. The goal was to try and make Genentech more productive and successful and a better operation.

Genentech Focus on Human Pharmaceuticals

Animal Health and Industrial Enzymes

Hughes: The Department of Agriculture approved Genentech's foot and mouth disease vaccine in 1981.¹ Yet despite the apparent success, Genentech dropped veterinary products. Do you want to comment?

Swanson: Application of the science looked to be good beyond human health, and a natural extension would be to animals. There was even some early plant work and a little work at industrial applications. It never got beyond maybe fifteen percent of the effort for all the non-human health side. What eventually happened can be characterized best by a Dave Packard comment to me at the board of directors. "You really ought to focus a little more, boy," he'd say. "Not too many companies die of starvation, but quite a few get indigestion." What he meant was, we had expanded and were trying to do a little too much. So we actually shrank back the effort to only human health.

The industrial enzyme business was a joint venture with Corning Glass, and that's been with a company called Genencor. That's been pretty successful. I ran into somebody the other day who said that Genencor was doing between three and four hundred million dollars worth of business now in industrial enzymes. Corning and ourselves are no longer part of it. It's a joint venture between a Finnish company [Cultor Ltd.] and Eastman Chemical.² So the ownership has changed, but it's nice to see, and that was spun out. The animal health products were licensed. Monsanto is now selling bovine growth hormone where you get 20 to 40 percent more milk production with very little additional feed intake. Well, obviously the risk when you license to others is the reason for the other strategy of retaining product rights. Monsanto took years longer than they should have to get that product to the market and botched it many ways in terms of its introduction. But it's approved and they're marketing it.

So we had these brief forays into these other fields, but then shrank back to focus on our main business. There was a brief period of time where we put our toes in other waters, and

¹"[Secretary of Agriculture John R.] Block Announces Production of Foot and Mouth Disease Vaccine," United States Department of Agriculture, USDA News Center, Washington, D.C., June 18, 1981.

²Genencor became a public company in 2000 and trades on the NASDAQ exchange. (TDK)

then, I think correctly, said, "Nope. Let's just focus on doing what we do best."

Criteria for Product Selection

Hughes: A book analyzing strategy in the biotechnology industry made some observations about Genentech. One was that Genentech made a decision to market its "own products to hospital specialists in four priority areas, endocrinology, immunology, cardiovascular agents and virology."¹ What was the rationale for marketing to hospital-based physicians? And were these four fields chosen because that's where you thought you had products? Or was there more to it?

Swanson: Insulin was licensed to Lilly. Growth hormone originally was licensed worldwide to Kabi of Sweden, which was the leader in the field.² But we were able later on, as we made quicker progress ourselves, to reduce their royalty rate elsewhere in return for getting back the rights to the United States so we could market growth hormone in the United States exclusively. That was very fortuitous.

I remember there were something like two hundred and fifty thousand doctors around the country. So a small company like ourselves couldn't market to all the physicians and explain and detail the products. But in the case of growth hormone, as I told you last time, there were only about five hundred pediatric endocrinologists around the country, specialists in treating disease. They accounted for most of, essentially all, the treatment of the patients with growth hormone deficiency. They were located in some major medical centers. So we said, with five hundred physicians to talk to about the product--and initially our sales force was only and have that be the beginning of our entry into selling products ourselves. So that really was the start of it.

We picked each of the other areas in part because we had products in the area or were working on products, but also because the physician audience, while maybe being a little larger than in the case of the pediatric endocrinologists, was still manageable. For example, in the case of tissue plasminogen

¹Peter Daly, *The Biotechnology Business: A Strategic Analysis*, (London: Frances Pinter Publishers, Ltd., 1985), p. 75.

²Initially, Genentech retained nonexclusive rights in the United States and later licensed back from Kabi its own U.S. rights. (TDK)

activator I think board-certified cardiologists are between two and three thousand. They're the ones treating heart attacks and tend to concentrate at major medical centers. We thought that's the next logical step up for us in terms of being able to sell these products. Whereas, if you picked a product that might be prescribed by a general practitioner, there's no way that we could compete against Merck or Lilly or any of the other companies. So we focused on areas where we might be able to market ourselves and not be at a disadvantage. In fact, with growth hormone, even though Lilly came into the marketplace later with all the power they could, we still maintain 80 percent market share.

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Hughes: Had you been advised to seek manageable markets?

Swanson: Well, early on, we hired marketing people from the pharmaceutical industry. So they had knowledge, and there were people in market research that you could consult. Maybe you would start out with one person, but you were able to have people focus on gathering the data.

The original philosophy was laid out before most of those people were on board as part of the original business plan, or the second version of it, which listed the criteria for product selection. One of the added criteria was that we could be able to market ourselves without being at a disadvantage in competing with a giant pharmaceutical company. The criterion was added that the basis for approval from the FDA should be clear. And then there was the time frame for proving that. If a clinical study would take ten years, you couldn't have your product on the market for twelve. So you're looking for clear endpoints where the studies could be done in a short time. And then you'd go back and ask, "Is it technically feasible to develop the product?" A whole set of criteria. Was the invention something that you could patent? So all those things went into the product selection process.

Hughes: Another of Daly's points is Genentech's strategy of "non-drug research spin-off into joint ventures."¹

Swanson: Well, this was a result of our focused strategy of clearing out the animal health products and the other things. As I mentioned, we had a couple of joint ventures. We had a diagnostics joint venture with Baxter-Travenol that didn't work, and an instrumentation joint venture with Hewlett-Packard that

¹Daly, p. 75.

didn't work. Only the joint venture with Corning worked. Joint ventures are very, very difficult because you have two different companies, different cultures, different goals.

Hughes: Was Genentech managed differently than other biotech companies?

Swanson: Well, I'm not as familiar with the others, and maybe it's better to look, for example, to what Bill Rutter says about Chiron.¹ But at the beginning we were very focused on products, and that made a big difference. I know Cetus at the time was more into developing the technology. I said, "Well, let's make a product, and we'll develop the technology we need to make the product, and let the product drive the science, rather than the other way around." Actually, we wound up doing better science because of that, and also we got a product. So it was a matter of incredible focus in those days. George Rathmann would be a good one to talk to about that because he has a broader view. He was nice enough to say, "Since you were breaking the path, I just tried to follow whatever you did." [laughter] He probably spent time looking at the different corporate models before choosing one for Amgen.

Reaction of the Pharmaceutical Industry to Biotechnology

Hughes: How was Genentech, as representative of the budding biotech industry, viewed by the pharmaceutical houses?

Swanson: I think in the early days, it took either great vision or great fear for the pharmaceutical industry to believe in biotechnology. For Lilly, it was fear because they saw threatened an 80 percent market share in selling insulin. So they were well motivated to try some things that in fact turned out well. I have to say that they weren't without vision. But [as I said previously], I think the person that captured the vision best was Bertil Åberg, who was head of research at Kabi in Sweden. He is part of the Nobel committee. He was one of the early people to say, "This is an important new science and technology, and we want to be part of it." He came over to talk to us and eventually was the reason we had an early relationship with Kabi in growth hormone. By and large, many other companies didn't believe it. Even after several visits to Syntex, they kind of laughed at us. Even after some of the products were on the market, people were saying,

¹A second ROHO volume of interviews with William J. Rutter in which he talks about Chiron is in process.

"Well, this recombinant DNA isn't going to be important." That's obviously now changed.

Hughes: Pharmaceutical houses were built around the old methodology of random screening for products. Introducing a different methodology would require company restructuring.

Swanson: In a way. Initial drug company apathy towards biotechnology wasn't crazy if you say that ninety percent or so of the products in terms of style and volume are pills or small molecules that can be taken orally. The early products of biotechnology were peptides and proteins that had to be injected. So you're talking about a technology built to deal with a relatively small percentage of their market, at least in its early form.

Now, today you see much greater excitement because what biotechnology's offering the pharmaceutical industry is a set of tools to discover small molecules. So as biotechnology's grown, it's fit more into the way they're thinking about it. The genetics leads to gene targets associated with disease, and then understanding and cloning of all the gene products can lead to the point where you might be able to interdict that disease process by blocking an enzyme action or something. That is their traditional way of thinking, so they're much more enthusiastically spending money today. Whereas in the early days, those that saw biotechnology, saw it in a limited framework. For example, Merck was interested because it fit into vaccines, which were proteins delivered to develop an immune response prior to getting the actual infection. It was a much more limited enthusiasm.

Hughes: So if what biotech offered fitted into the existing program of a pharmaceutical house--in Lilly's case insulin, in Merck's case hepatitis B vaccine--then maybe they were interested. But they didn't say, "Ah, here's a wonderful new way of developing drugs. We must get into the act."

Swanson: No, there wasn't any of that. And even when we set up this alliance with Roche many years later, 1990--and you're talking about a major alliance--there were others sort of interested, but Roche was the only one that was very interested. They had a long history of investing in the field through a research institute in Nutley, New Jersey and some other places there. So a lot of the enthusiasm has been generated relatively recently; year fifteen on into twenty has seen a dramatic increase in pharmaceutical company enthusiasm, compared to the early days.

Intellectual Property

Hughes: All right, patenting. [tape interruption] I want to start with the *Diamond v. Chakrabarty* Supreme Court case because I understand that Genentech participated as an *amicus curiae*. Did you have any particular part in the proceedings?

Swanson: Tom Kiley, who has a very good memory about what happened in the early days, would be somebody to talk to.¹ In the early days, we felt that the ability to patent microorganisms would be very, very important to the future of this industry. So this case, which didn't have a lot of commercial relevance, had a great deal of relevance to the biotechnology industry in terms of drug development. We felt that we needed to participate and we did, and fortunately the court made the right decision.

Hughes: I suspect that you had to educate, or that Mr. Kiley had to educate, the scientists as to why intellectual property was at the core of what you were trying to do.

Swanson: Well, there's a quote from Lincoln--and I'm sure I'm not quoting him right--on the side of the Commerce Building in Washington, D.C. It says that patents add the fuel of interest to the fire of genius, or something like that. It's been clear for a long time that patents were critical for commercial development. It was really a critical part of this process to get scientists to understand that. It was somewhat in conflict with this idea that we were going to publish, and that was critical to getting the very best scientists and having them and the company be recognized for the quality of their research. So we developed this idea that we are going to publish our work because we think we get more benefit from doing that than we lose by telling our competitors what we're doing. But we're going to patent it beforehand.

As a philosophy, what happened is: scientists, you write and publish just about as quickly as you can, and we'll make sure the patent attorneys work around the clock on the weekends to get the patent application filed before the publication actually gets out there. In reality, that was the right message to send from both sides: scientists, you're in control of this, and we're going to have business or patent people work to your schedule. What happened in reality was that there were compromises: I've got to get this patent application in. Can you send your manuscript in

¹See the ROHO oral history in process in which, among many other topics, Mr. Kiley discusses the *Chakrabarty* case for which he wrote Genentech's *amicus curiae* brief.

to *Nature* two weeks later." But we're talking weeks, days, not a longer delay.

Hughes: You're saying that scientific communication was not substantially delayed because of the patenting process?

Swanson: Not at all. It went essentially on schedule--probably faster than it would have happened in the academic world because these were all young scientists wanting to build their own reputation. By and large the patent people danced to the scientific beat.

Hughes: Did every potential publication go through a vetting process, presumably by the legal department?

Swanson: There's a process to make people aware that when they have an idea they need to write it down in their notebook and sign it so that the time of conception is recorded. So there was education where, "Okay, you have a great idea. Write it down; get somebody to witness it, and then go and talk to the patent people to see whether it's something that should be patented or not." So there was this great awareness: patents are really important. But how do we get them without slowing down the publication process? It seemed to work pretty well.

The other things that they had to learn was, you can't go out and just give a seminar about this stuff until the patents are done. So it's not only publication, but it's also talking about it. But again we said, "Look, you schedule a seminar, but you make time available prior to that because we've got to get all these patents filed. If the patent lawyers need access to you so they can get them filed so that you can give your seminar when you want to, you've got to be there." So it was that kind of thing, and it seemed to work pretty well.

Hughes: You're not aware of instances where information got out before it was protected?

Swanson: None that I remember.

Hughes: Genentech has a reputation for being aggressive in terms of intellectual property. Do you want to comment?

Swanson: One aspect of it we haven't talked about was that because we were the first to produce human hormones in microorganisms, we got some very broad patent protection. We decided to use that to protect our early products, but then we licensed it broadly for anything beyond that. It was a very inexpensive license, and we donated those royalties to the Genentech Foundation, which now invests in biomedical research and other things in the local northern California area. The idea was that you needed to

protect your own products--that was critical. But you didn't want to stop the development of the science; otherwise you'd block everybody out of the business. I think you do need to be aggressive. I think Tom Kiley has the analogy. He says it's sort of like you've planted the seed, and you've raised the crops, and someone else comes and steals the corn. Well, you know, that isn't right. [laughter] So you have to stop them from doing that. We've had some battles, but only when somebody was trying to steal our corn.

The Somatostatin and Insulin Projects

Press Announcements

Hughes: I read that Genentech made the announcement of the cloning and expression of human insulin before the research had appeared in a peer-reviewed journal.¹

Swanson: In that first expression of insulin,² there was obviously a rush to get all the patents filed. Then City of Hope was very aggressive in wanting to make an announcement about this; a significant part of the work had been done there. They're an institution that raises all their funds every year; there are no endowments. So they wanted to have a seminar at their institution and make a big announcement. I think Art Riggs³ or someone else made a scientific presentation which, although not as complete as a publication in *Nature*, was still an accepted way of breaking new news in terms of being part of a conference or something. But there was some criticism.

Hughes: Are you saying, it was really City of Hope more than Genentech that was behind the public announcement?

Swanson: They were very much pushing. We didn't fight it because having it earlier didn't hurt us. It was a race, you know. We didn't know where Gilbert was on this, and it was clear that we were successful. We wanted to let people know. It has been proven

¹"Labs Induce *E. coli* to Make Human Insulin," *Medical World News*, September 18, 1978, p. 10-11.

²Mr. Swanson says "insulin" here but means somatostatin. The reader will find that Swanson corrects himself a few paragraphs later.

³*Time* magazine credits Keiichi Itakura with making the presentation, although it is quite possible that Riggs participated. ("Creating Insulin," *Time* magazine, September 18, 1978, p. 102.)

clearly that we were successful way ahead of everybody else. At the time, we didn't know that. On one hand, you wanted to make sure it was patented, and then you wanted to let people know. [pause] I'm confused here; I was talking about somatostatin rather than insulin.

Hughes: I'll make a note in the transcript to clarify.

There also was a public announcement regarding Genentech's successful cloning and expression of human insulin [September 6, 1978].¹

Swanson: I don't remember that as clearly as the somatostatin announcement. That's what I was talking about earlier.

Hughes: Where was the press announcement about insulin made?

Swanson: I don't know where it was. [pauses to think] It may have been made at City of Hope, as well.² I know we had this long negotiation with Lilly, and the only thing that got them to sign was that they wanted to be part of the announcement. They flew a team out on the weekend, and we worked the weekend in L.A. So it makes me think the announcement was at City of Hope so Lilly could be part of the announcement as if they were really part of this development, because pieces of the genes were synthesized there.³

Relations with Eli Lilly

Hughes: Was the contract with Lilly the first Genentech had made?

Swanson: No, I think actually the Kabi contract was signed first, even though we had started the discussions on insulin earlier. Again, the insulin agreement didn't get signed until right before we announced it.

¹"First Successful Laboratory Production of Human Insulin Announced," Genentech Inc., September 6, 1978. (Corporate Communications files, Genentech).

²Mr. Swanson is correct.

³The agreement was signed on Sunday and success in cloning insulin was announced on the following Monday. Lilly was part of the achievement in the sense they had financially supported the project while negotiations proceeded. (TDK)

Hughes: Do you have any comment to make about what I gather were not the easiest of negotiations with Lilly?

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Swanson: There was a difference between Kabi having the vision--at least Kabi's senior technical guy--and Lilly being motivated by fear. If you are motivated by fear, you don't do anything until you absolutely have to, right? I was in this negotiation, trying very hard to figure out how a tiny company like ourselves could protect the technology, because obviously you're going to give it to someone else to make the product, but they can steal it. I was trying to figure out how to structure the deal, and that was part of the delay as well, because it was the first one we wrote.

People thought I was a little paranoid about it. But what happened is, Lilly did exactly what I was worried about. They took the technology and started working on growth hormone. It wasn't until just recently that we managed to settle that suit for over a hundred and fifty million dollars. The other side of patents is they only give you the right to sue, and if the big company wants to spend millions and millions of dollars to fight you, unless you've got that same money to spend, you're at a disadvantage. In the meantime they can be using the technology. Even though I was worried about that, I guess I was quite a bit surprised that these big "ethical" pharmaceutical companies would behave that way. I'm very disappointed in the way Lilly behaved.

Hughes: Was it a considerable financial burden for Genentech in those early days to fight a pharmaceutical company?

Swanson: Well, we didn't even know about Lilly's misuse of our technology until much later. It didn't come out until later that they had actually taken it for other purposes. Then, of course, we were much stronger and able to fight it. But that's another reason why you have to eventually make and sell your own products. It's because you can't rely on others.¹

Lawsuit with the University of California, 1982

Hughes: There was a lawsuit in 1982 in which UC sued Genentech, claiming that Genentech had illegally obtained a cell line used in the insulin work. Do you want to comment on that suit?

¹I believe Bob meant other companies don't always keep their promises. (TDK)

Swanson: I don't remember a great deal.

Hughes: If it had been a real threat to the financial survival of Genentech, I suspect you would remember it.

Swanson: Not necessarily. [laughter]

Hughes: I read that it was growth hormone, rather than insulin, that indicated that a viable company could be built on genetic engineering. Would you agree with that assessment, which I got from an article in *Esquire* written in 1984?¹

Swanson: Yes, because it was the first product that a biotechnology company had developed in its own labs and then was proposing to market itself. The other products had been licensed to others, and in some sense you needed to complete the development cycle, and that was really the first time it had been done.

Negotiating: Substance and Style

Hughes: Please comment on negotiations concerning growth hormone.

Swanson: I remember going over to Sweden with Herb [Boyer] to negotiate the deal in the wintertime and just getting out of Stockholm ahead of a blizzard. [laughter] I still remember that clearly!

Hughes: Was it typical of those days that it would be you and Herb doing the negotiations?

Swanson: Well, that was actually our first trip to Europe as part of the discussions. We visited with Kabi and Institute Merieux, with the latter to discuss hepatitis vaccine. I think we may have seen some others companies but I don't remember. When we arrived at Kabi, they had the American flag flying out in front, and it was such a nice feeling because I had never been to another country on business before. So we adopted that custom at Genentech, and today if you come to visit from another country, we put up your flag in front of the building.

Hughes: Are there any general characteristics of negotiations with a European company different from those with an American? A different ethic?

¹Randall Rothenberg, "Robert A. Swanson, Chief Genetic Officer," *Esquire* magazine, December 1984, 366-74.

Swanson: No, I think that by and large the relationship with Kabi was really outstanding. We did have a vaccine relationship with Merieux, but they behaved, I thought, very badly. They slowed the development of the hepatitis vaccines until their colleagues at Pasteur came up with their own product and then decided to market the Pasteur product rather than ours. So we had to sue them to get the product back. But it's a shame because Merieux was the number-one vaccine competitor to Merck, and they probably could have done a lot better if they had moved more quickly than they had. So that was disappointing.

It was fun negotiating these agreements with Tom Kiley because I'd get very set that we needed at least these terms, and he was willing to trade off different points: "Well, you can give them this and get this." And I needed that advice in those days in order to come to those agreements. After I'd sign an agreement, I was sure for the next two weeks that I'd given away too much. [laughter] But they were all critical for our development in those early days.

Hughes: Do you have the reputation of being a tough negotiator?

Swanson: No, I don't think so. I wasn't tough; it was just so important. You could only give things away or license them once, right? Am I asking for enough? Am I protected? What can they do to cheat on this?

Hughes: I can imagine it felt a bit overwhelming because of the disparity in size of the two business entities.

Swanson: I think I've always been sort of fair. It has to be fair. Both people have to win on these things. I think what drove me and motivated me was the disparity in size between the companies in those early days, and how we were really at the mercy of these larger companies. Was there anything that you could put in the agreement that would help protect you? We tried to think of all those things. But nobody had done any of these agreements. It wasn't like you could look and say, "Okay, here's how somebody else does it," because we had to really invent them as we went along. So that made you more nervous about it. It was more than toughness.

Interactions with Other Biotechnology Companies

Hughes: Did you have any significant interaction with the other early biotech companies? I'm thinking of Amgen and Biogen and eventually Chiron.

Swanson: Very, very little. I think we talked about the origins of Biogen and Dan Adams, who was with International Nickel.

Hughes: Yes, you did.

Swanson: So there was some early interaction there. You never can say whether it would have been good or bad. To the extent you were thinking more broadly about other pieces that could be consolidated, then you'd take your mind off what you were doing.

Hughes: Were these newer companies hot on your tail?

Swanson: Oh, the competition was intense--and you were competing against the academic community, too--not only for the products but also for raising money and attracting people. You were competing in a whole range of areas.

Hughes: The fact that Genentech was first off the mark gave it a considerable advantage?

Swanson: I think it gave it some advantage, but the technology was developing rapidly, and things that took a long time at first were later more quickly done. So you had to keep moving very quickly in order to stay in the lead.

Swanson's Retirement from Genentech's Board of Directors, 1996¹

Swanson: At the end of last year [1996], I retired from the board of the company and continue to be a consultant. It was twenty years, and it was a time for me to say, "Twenty years is enough." I was comfortable with the leadership that was in place and with Art Levinson who started at Genentech as a postdoc and is now the chief executive officer. That was something very nice to see, and I think his leadership will continue and do well. It also allowed me a chance to focus more energy on venture capital and helping other companies get started.

What was very nice is the spontaneous e-mails and other things that came as people heard about this, saying, "Gee, we're sorry you're not here because we still get energy when you walk around the halls." Which is what I used to do in the early days. People would really appreciate having me walk by and be interested in what they were doing: "How's it going? What's

¹This section was moved for better chronology from its original position earlier in the transcript.

new?" Also, for them to say, "Gee, this is a wonderful place to work. Thank you for helping create it that way." Within the last year, they hired an outside consultant to look at the culture. The response was, "I've never been in a company like this where people understand clearly what the goals are as well as what their individual role is in achieving those goals and are as excited and motivated to work hard and upbeat about what they're doing." It's changed, and those that have been there a long time say, "Well, gee, it's not like it was in the old days." You always have that, but it's nice to see the basics of the culture continue and get confirmed by an outside reviewer.

Guiding Principles

Hughes: Is there a guiding principle that you've used throughout your career?

Swanson: Well, I think I tend to be honest and straightforward in my dealings with people. And I focus quite a bit on how do you create value, how do you build value, what are the things that a company can do to make itself more valuable? Those are the things that come to mind right now as we sit here.

Hughes: If you had it to do over again, what would you do differently?

Swanson: I think many of the strategies and philosophies were by and large right on. I might have looked a little more outside the company we were building to what was going on in other companies and technologies, looking at how those might be consolidated or incorporated into one entity. I had very much of a live-and-let-live approach. I think it was fine, but I think more things could have been brought together in those early days.

Hughes: Are you thinking of the budding biotech industry? Or broader than that?

Swanson: No, the biotech industry. As technologies developed outside, I don't know that we-- Mergers and acquisitions are always difficult to do, so we tended just to focus on what we developed ourselves. But I think there's a role for them in terms of the ability to more quickly build up a company. I think we could have spent a little more time looking outside.

Swanson's Most Significant Contribution

Hughes: What do you see as your most significant contribution?

Swanson: Well, I'm very proud of the way the company has turned out--the culture in the company and the way it works as an enterprise. I think the philosophy of Genentech is a good one, and it's contributed significantly to its success. I'm proudest of the people that we've been able to attract, the things that we've been able to accomplish, and the way we've gone about doing it. I think we did a lot of things right.

##

Hughes: You made a comment off tape about the academic perquisites of Genentech. Will you say a word for the record?

Swanson: Oh, sure. There were two or three seminars a week by people coming from all around the world. There was the idea that postdocs were an important part of bringing new tools, new ideas, energy to an enterprise. Genentech had and still has an enormous postdoc program. There are now sixty to ninety throughout the company. It was a way of attracting some of the best scientists. If you could keep the best of the postdocs, they became new scientists in the company, and there was an energy and excitement that came from having that there. There was very much an academic atmosphere. I think the difference between us and some of the other companies was we had this goal of products, and the drive for products drove the science.

Hughes: Well, thank you.

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ROBERT A. SWANSON

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Single 5 feet 7 150 pounds excellent health

Education

1965-1970

ALFRED P. SLOAN SCHOOL OF MANAGEMENT, M.I.T. Cambridge, Mass.
Master of Science in Management - June 1970
Studies emphasized Marketing and Organizational Development.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY Cambridge, Mass.
Bachelor of Science in Chemistry - June 1970

Experience

1976-Present

GENENTECH, INC. - President San Francisco, CA

1975

PARTNER - KLEINER & PERKINS VENTURE CAPITAL PARTNERSHIP
San Francisco, CA
Three man organization investing in and managing the growth of
early stage technology companies. Responsible for the higher
risk funds of several institutions and wealthy families.

1970-1974

CITICORP VENTURE CAPITAL LTD. New York, NY
San Francisco, CA
Investment Officer responsible for analyzing and advising
venture capital investment situations. Duties include
developing potential investment opportunities, structuring
and negotiating investment terms, investment decisions,
and board level direction of small rapidly growing companies.
Concentrated on the West Coast investments of the \$70 MM
portfolio. Instrumental in establishing the first domestic
branch office in San Francisco.

1969

ROHM AND HAAS Philadelphia, PA
Summer position as a Market Research-Commercial-Development
Specialist. Responsible for analyzing new markets and
recommending action. Originated and completed study on the
use of pressure sensitive systems in the mobile home industry.

1968

HERCULES Wilmington, Del.
Summer position as a Chemist in the Materials Science Division
of the Research Center. Developed new physical testing
procedures for studying the crazing behavior of the thermoplastics.

Military

Honorable Discharge - U.S. Army Reserve - 71st Judge Advocate
General Detachment, The Presidio of San Francisco.

Background

Born in New York City; raised in Miami Springs, Fla. Interests
include participative sports, theatre, music, and reading.
Basic knowledge of German.

References

Personal references will be furnished upon request.

(Swanson's curriculum vitae around the time of Genentech's foundation.)

Genentech, Inc.**ROBERT A. SWANSON**

Co-Founder, Genentech

Robert A. Swanson founded Genentech in 1976 with Dr. Herbert Boyer, a biochemist at the University of California at San Francisco. Swanson, then a 29-year-old venture capitalist, approached Boyer about the possibility of developing biotechnology and marketing useful products using recombinant DNA technology.

Although significant advancements were being made in the area of molecular biology in the 1970's, industry had yet to recognize the potential application of these advancements. Swanson realized the opportunities for recombinant DNA technology to create beneficial new products. Under his guidance, Genentech has provided broad applications of this science to modern society, developing new products such as human insulin, interferons, human growth hormone and thrombolytic agents.

Swanson was chairman of the board of Genentech, Inc. from February 1990 to December 1996. Prior to that time he served as a director and as chief executive officer of Genentech.

Prior to forming Genentech, Swanson was a partner with Kleiner & Perkins venture capital partnership in San Francisco, and from 1970 to 1974, he was an investment officer with Citicorp Venture Capital Ltd.

Swanson has a bachelor of science degree in chemistry from the Massachusetts Institute of Technology and a master of science degree from MIT's Sloan School of Management.

He serves on the board of fellows of the Faculty of Medicine at Harvard University and is a member of the Biology Visiting Committee of, and has served as a trustee for, the Massachusetts Institute of Technology. Swanson is a member of the Royal Swedish Academy of Engineering Sciences, a member of the board of Molten Metal Technology, Inc., and chairman of the board of Tularik, Inc. He also serves as a trustee of the San Francisco Ballet, and the Nueva School.

#

GENENTECH

Outline for Discussion
KLEINER & PERKINS
April 1, 1976

- I. Corporate Background
- II. Technology Update
 - A. Synthesis
 - B. Stitching
 - C. Replication and control
 - D. Development Program
- III. Corporate Goals and Strategy
- IV. Initial Product
 - A. Criteria for selection
 - B. Market Estimate
 - C. Rough economics of production
- V. Funding Stages and Capital Requirements

CORPORATE GOALS

- To engage in the development of unique microorganisms that are capable of producing products that will significantly better mankind. To manufacture and market those products.
- To build a major profitable corporation.
- To advance the state of the art of molecular biology and make significant contributions to understanding the life processes.
- To attract and motivate outstanding people.

STRATEGY

- To identify one existing market where a company engineered microorganism could economically compete with current production techniques. (see product characteristics)
- To produce and market the product on an OEM basis to the major suppliers in that industry.
- To be the first company to successfully commercialize "DNA stitching" technology.
- To proceed with the engineering stage without investing in substantial amounts of capital equipment.
- To use our successful completion of the first engineered microorganism to attract additional capital for production and laboratory equipment, marketing expense and development expenses for follow on products.
- To build a marketing organization by picking products that follow similar marketing, distribution, and customer service channels.
- To develop corporate strengths so as to be ready to supply biologically active polypeptide hormones and antibodies as the technology evolves.

PRODUCT CHARACTERISTICS

1. Bugs that can be built with the current technology.
2. Established market need for the product which is available today only in limited quantities or at high prices
3. Estimated cost of production a fraction of current selling price (i.e. potential for high profit margins)
4. Market potential greater than \$10M
5. High value, low volume product to keep capital equipment and production cost down
6. FDA requirements limited to proof of purity
7. Well defined limited customer base
8. Major impact on well being of mankind

INSULIN

According to the National Commission on diabetes, ten million Americans suffer from the disease. Of these, three million take some medication and half of these regularly use insulin. The incidence of diabetes is increasing at 6% per year.

Insulin is distributed by two U. S. manufacturers, Eli Lilly and ER Squibb and Sons, either directly (Squibb) or through wholesalers (Lilly) to local pharmacies. The product is sold without prescription in three concentrations and various forms - Regular, NPH, Lente, Semi-Lente, Ultralente, Globin and Protamine Zinc. The various forms are complexes that allow for the delayed release of insulin within the body. A patient can mix various types to obtain a more level daily body concentration tailored to his diet and lifestyle. Depending on concentration and type, the product sells for between \$1.70 and \$4.00 for 10cc.

From the different sources of raw data, the end user market size can be estimated several ways:

1. There are 1.3M to 1.5Million users (United States) of insulin who, according to Squibb and the National Commission on Diabetes respectively, spend between \$100 and \$150 annually for insulin. The estimated U. S. market is between \$130M and \$225M.
2. There are approximately 35 billion units of insulin used annually in the United States. Taking an average of 800 units per 10 cc vial at an average price of \$3.00 per vial, the market is estimated at \$131 million.

Pharmacies use insulin as a loss leader, taking a very small markup, perhaps 10%. Diabetics usually require other medications,

and aside from humane reasons, pharmacies would like to use a low price to attract these good customers to the store. Wholesalers work on a 33% mark up.

Taking a conservative end user market size of \$130 million and 50% total markup, it appears that the drug companies are looking at an \$85 million market. Because the use of insulin is not as extensive in other countries of the world (i.e. Russia with a similar population uses 1/10th the U. S. quantity of insulin) it is estimated that the world market is 150% of the U. S. market, or around \$130 million.

Because of Genentech's strategy to market insulin on an OEM basis to a major pharmaceutical company who will pay for the right to market the product on an exclusive basis, and who will be responsible for the final purification steps and regulatory approval, Genentech's market is smaller. Genentech will replace the major slaughter houses. The largest suppliers of bovine and porcine pancreas (the gland which is the source of insulin) to the industry include Armour, Swift, Wilson, Oscar Meyer and others.

In 1975, there were 36 million cattle and 65 million hogs slaughtered under governmental inspection by the Department of Agriculture (92% of the total slaughter). According to the American Meat Institute, the average weight of pork pancreas is .121 pound and the average beef pancreas is .585 pound per animal. Total U. S. production of pancreas glands is estimated at around 30 million pounds. The current market price is \$1.10 for both hog and cattle pancreas. It has increased from \$0.40 per lb. in 1972. Since there is a shortage of pancreas, it is assumed that almost all the production is used for insulin (the only alternative use is the byproducts vat), resulting in a \$33 million US market.

ECONOMICS

- Insulin is currently extracted from bovine and porcine pancreas which are sold in bulk to the producers at a current price of \$1.10 per pound.
- The extraction process is .01% efficient by weight.
- Based on this conversion factor and forgetting the costs of the complicated extraction and purification process (some of which would be eliminated with our product), the pharmaceutical companies should be willing to pay \$11,000 /lb. for insulin.
- Our production would take place in a 150 liter vessel where three to five pounds of bacteria cells could be produced on \$100 of medium using one technician on an eight hour shift. Current yields indicate that insulin would exist at between 10-30% of the cell weight. Results: .3 to 1.5 pounds of insulin valued at \$3,300. to \$16,500 per shift.
- Based on one pound of insulin from every ten thousand pounds of pancreas, there is a need for 3000 lbs of insulin in the US market. A 150 liter vessel on three shifts, 200 days per year, could produce 20% of the US needs.

FINANCING

STAGE I

- To be accomplished
 1. Complete screen for optimal first product
 2. Formalize business plan
 3. Negotiate license agreement with the universities
 4. Identify and attract other key technical people
 5. Formalize facility arrangements
 6. Raise the money necessary for Stage II
- Time to accomplish above - maximum six months
- Cost - approximately \$6,600 per month

STAGE II

- To be accomplished
 1. Build the desired microorganism
 2. Negotiate marketing agreements
 3. Identify next product
 4. Raise money for production and laboratory facilities
- Time to accomplish above - one to one and one-half years
- Cost - approximately \$500,000.

STAGE III

- Fully operational company

STAGE I: Monthly Budget

- Salary	
Management	\$2,500
- Rent (with secretarial service)	500
- Office Expense	100
- Travel & Entertainment	700
- Telephone	300
- Legal	1,500
- Consultants	<u>1,000</u>
	\$6,600

STAGE II

A. Monthly Budget

Salaries

1 Senior Organic Chemist	\$ 2,000.
2 Junior Organic Chemists	2,500.
1 Microbiologist	1,500.
1 Secretary/bookkeeper	1,000.
Boyer	1,000.
Swanson	<u>2,500.</u>
	10,500.

(marketing and production positions
filled near end of development)

Payroll Taxes and Benefits (12%)	1,260.
----------------------------------	--------

Occupancy Costs

Office	1,000.
Laboratory	?

Supplies

Office	100.
Laboratory	5,000.
Xerox Costs	200.
Telephone	500.
Travel and Entertainment	1,000.
Depreciation	500.
Consultants	1,000.
Legal and Accounting	<u>1,000.</u>
	\$22,060.

B. Capital Equipment

Office	5,000.
Laboratory	<u>55,000.</u>
	\$60,000.

BUSINESS PLAN OUTLINE

- I. Corporate Description
 - A. Nature of business
 - B. Corporate history
 - C. Goals and philosophy
 - D. Projections
- II. Placement
 - A. Description of security, money raised, number of shares
 - B. Use of proceeds
 - C. Capitalization
- III. Technical Background
 - A. History of discoveries
 - B. Current technology
 - C. Future potential
- IV. Market
 - A. History of disease
 - B. Current treatment
 - C. Size and growth - domestic and international
 - D. Competition
 - 1. Products currently offered
 - 2. Cost and pricing
 - 3. Distribution and customer service
- V. Product
 - A. Proprietary nature
 - B. Cost advantages
 - C. Marketing strategy
 - D. FDA Regulations
 - E. NIH Guidelines
- VI. Development
 - A. Technical development steps
 - 1. Time
 - 2. Cost
 - 3. Personnel requirements
 - B. Capital equipment requirements
 - C. Facilities contract
 - D. Patent rights

VII. Financial

A. Projections

1. Profit and Loss
2. Balance Sheet
3. Cash Flow

B. Banking relationship

C. Additional financing required

VIII. Management

A. Responsibilities, resumes

B. Board of Directors and scientific advisors

IX. Appendix

A. Product literature

B. Market Data

C. References

1. People
2. Market
3. Technology

GENENTECH, INC.

1979

CONFIDENTIAL

CORPORATE PLAN

COPY #

4

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GENENTECH 1979 CORPORATE PLANTABLE OF CONTENTS

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I. CORPORATE MISSION

- A. Genentech is a privately financed high technology corporation owned by management and venture capital investors. Its purpose is to commercialize and bring to the public the benefits of new molecular biological technology.
- B. Genentech is a fully integrated company engaged in the research, development, manufacture and marketing of commercially valuable substances produced by specially engineered microorganisms. It is also in the business of conducting contract research and the sales of specially designed microorganisms.
- C. The company has built one of the finest scientific teams in its field anywhere in the world. Genentech will continue to attract and motivate outstanding people to further build its capabilities in research, manufacturing, marketing, finance and administration.
- D. Genentech's technology will have applications in a broad range of pharmaceutical and industrial markets. It will be capable of producing widely varied products including human and animal hormones, vaccines, immune response stimulators, antiviral drugs and numerous enzyme catalyzed chemicals and biochemicals. Genentech will be creating products, some of which are too scarce or too expensive to produce today and some of which will be directed toward totally new markets.

II. CURRENT BUSINESS POSITION

A. PERFORMANCE MILESTONES

- Jan. 1976 • Herbert Boyer of the University of California at San Francisco, and Robert Swanson of Kleiner & Perkins begin a cooperative partnership to investigate the most promising commercial applications for recombinant DNA technology.
- Mar. 1976 • Genentech's Initial Business Plan is prepared to outline the steps for developing the bacterial production of somatostatin in 1977 and for developing human insulin in 1978.
- April 1976 • Genentech is Incorporated - Thomas J. Perkins, Herbert W. Boyer, and Robert A. Swanson are elected to the Board of Directors.
- May 1976 • Initial financing provides Genentech, Inc. with \$100,000 seed capital @ \$.50 per share raised from Kleiner & Perkins venture capital partnership.
- Dec. 1976 • Negotiations conclude successful Research Agreements with University of California, San Francisco, City of Hope National Medical Center, Duarte, and California Institute of Technology, Pasadena. Genentech will fund and manage research with rights to commercialize the products developed and receive protection under any patentable inventions in return for a small royalty on product sales. Dr. Keiichi Itakura, a specialist in DNA triester synthesis, and Dr. Arthur Riggs, an expert in bacterial control mechanisms, join Genentech team.
- Feb. 1977 • Somatostatin Project begins.
- Mar. 1977 • A second round of financing provides \$850,000 for funding the somatostatin project. The money was raised from Kleiner and Perkins (Hillman, Rockefeller Families), the Mayfield Fund (Ford Foundation), INCO, Innoven Capital (Emerson Electric and Monsanto), Sofinnova, and Hambrecht and Quist for \$2.89 per share.
- Aug. 1977 • Genentech accomplishes a major scientific breakthrough by achieving the first microbial expression of a human hormone, somatostatin. The somatostatin project was completed in seven months. The achievement is acclaimed as a "scientific breakthrough of the first order" by Dr. Philip Handler, President of the National Academy of Sciences, before a Committee of the U.S. Senate.

A. PERFORMANCE (CONT'D)

- Nov. 1977 • Insulin Project begins.
- Feb. 1978 • Genentech leases space and completes the initial construction of new facilities at 460 Point San Bruno Blvd., South San Francisco. DNA synthesis work continues at the City of Hope, but gene ligation, stitching and expression are accomplished at our new "world headquarters."
- Mar. 1978 • A third round financing to provide \$950,000 at \$8 per share for financing the insulin project is quickly completed. This new equity is expected to be sufficient to complete the insulin project and Genentech's Phase II expansion program.
- Aug. 1978 • Bacterial production of "Human" insulin achieved in ten months - ahead of year end schedule. Genentech also signs its first major development contract with _____, to begin developing the bacterial production of human growth hormone. Genentech will receive cash payments and royalties, while retaining marketing rights.
- Sept. 1978 • Eli Lilly signs a contract with Genentech for the rights to manufacture and market Genentech developed human insulin. Agreement calls for multimillion dollar payments and continuing product royalties on net sales.
- Nov. 1978 • Research for bacterial expression of human interferon begins.
- Dec. 1978 • Phase II of Genentech's facilities expansion program is completed to add one new organic, two new biochemistry laboratories, and offices. Genentech expands its team to 26 employees (with 12 Ph.D.'s), and an additional 12 outside consultants.
- Dec. 1978 • Genentech's second Business Plan is completed outlining the company's strategy for a fully integrated product development program which requires a doubling of staff and facilities in 1979.

B. CORPORATE STRENGTHS/WEAKNESSES

- One of Genentech's primary strengths is the quality and depth of its excellent technical team. The company has brought together under one roof an outstanding group of professionals from all over the world. Our skills include DNA synthesis; m-RNA extraction; gene assembly, splicing, ligation; manipulation of bacterial control mechanisms; enzymology; bacterial fermentation; and protein expression purification, and separation. Genentech will continue to acquire complementary scientific disciplines as needed.
- Genentech has attracted and hired a well rounded management team in finance, marketing, and manufacturing. The company is just beginning the extensive market research required beyond its earlier work in insulin. Currently there is only a small marketing staff and the company's detailed marketing strategy will be developed during 1979.
- Genentech established the position as the "technical leader" among the academic and commercial groups pursuing applications of recombinant DNA research. Using this technology in 1977, the company achieved the first bacterial expression of a protein, somatostatin. Again, in 1978, Genentech achieved the first production of a major marketable human hormone, human insulin. These achievements have been widely recognized by the world's scientific and industrial communities, and in perspective will probably mark the beginning of a concerted effort to develop a large number of new drugs and products utilizing this new technology. As an early entrant into this field, Genentech has retained an outstanding patent attorney and has filed a number of broad patents to protect its proprietary position. Patents currently on file should act as substantial barriers to other corporations use of the technology.
- Genentech's current financial condition is sound. At its current size, the company is able to operate at a cashflow breakeven with existing contract revenues. To grow substantially, however, and realize the full market potential for the products developed from its technology, the company will have to raise additional equity to finance future marketing and manufacturing capabilities, and to fund the clinical trials necessary to introduce a number of the promising new drugs being developed.

C. COMPETITIVE POSITION

- Genentech is at the forefront of the recombinant DNA field as measured by capability and achievement. Genentech has the only technical teams integrating all the needed technologies for efficient product development.
- By continuing to develop the latest techniques, and by extensive patenting of inventions, Genentech believes it will be possible to maintain substantial industrial leadership in this technology. Industry has not to date shown significant innovation in this field and most are two years away from an effective product generating capability using recombinant DNA. Recent advances have created substantial outside interest among large corporations who have now begun to initiate their own research programs.
- In manufacturing, Genentech is well along in the commercial scale-up of its technology and has an operating manufacturing facility. Academic institutions are generally not concerned with the commercial aspects of this technology, and major corporations are not believed to be addressing the unique process development problems of the technology.
- As a basic source of valuable and complex proteins and pharmaceutical substances, Genentech's manufacturing technology promises significantly lower production costs than those from other available sources of supply. Of course, some of the proteins under development are substantially unavailable using any technology.
- While enjoying a technical advantage, Genentech obviously does not have the enormous financial reserves and marketing muscle which are beneficial in the development, testing, and marketing of new pharmaceutical products. The company will have to develop and implement a strategy which allows it to grow successfully among an industry of giants.

III. CORPORATE STRATEGY: SUMMARY OF GOALS AND OBJECTIVES

- A. Genentech will seek to strengthen its leadership position in the new field of applied molecular biology by increasing the breadth and depth of our scientific expertise and engineering new products.
- B. In 1979 Genentech will realize sales to the research/clinical markets from its first commercial products: somatostatin in the third quarter and thymosin in the fourth quarter.
- C. In 1979 Genentech will build at its present location the facilities for an integrated manufacturing facility to include fermentation, separation, purification, sterile bulk packaging and quality control. The facility will be capable of handling the existing fermentation requirement of 2,100 gms per year capacity of pure sterile bulk product.
- D. Genentech will undertake market research in early 1979 to determine which additional significant industrial and pharmaceutical markets can be served using the company's technology. The company plans to pursue the early development of a large number of new products to assure that adequate products are available for licensing, technology sales, clinical trials, and product sales.

For each new product developed Genentech will decide, based on the appropriate criteria of market size, cost, and competitive characteristics, whether each product should be:

1. Developed on a contract research basis;
2. Developed independently and the process technology sold or licensed; or
3. Developed, manufactured and marketed independently.

As a general philosophy, Genentech desires to use contract research and technology sales licensing as a source of revenues sufficient to cover Genentech's overhead costs and support the company's own product development effort.

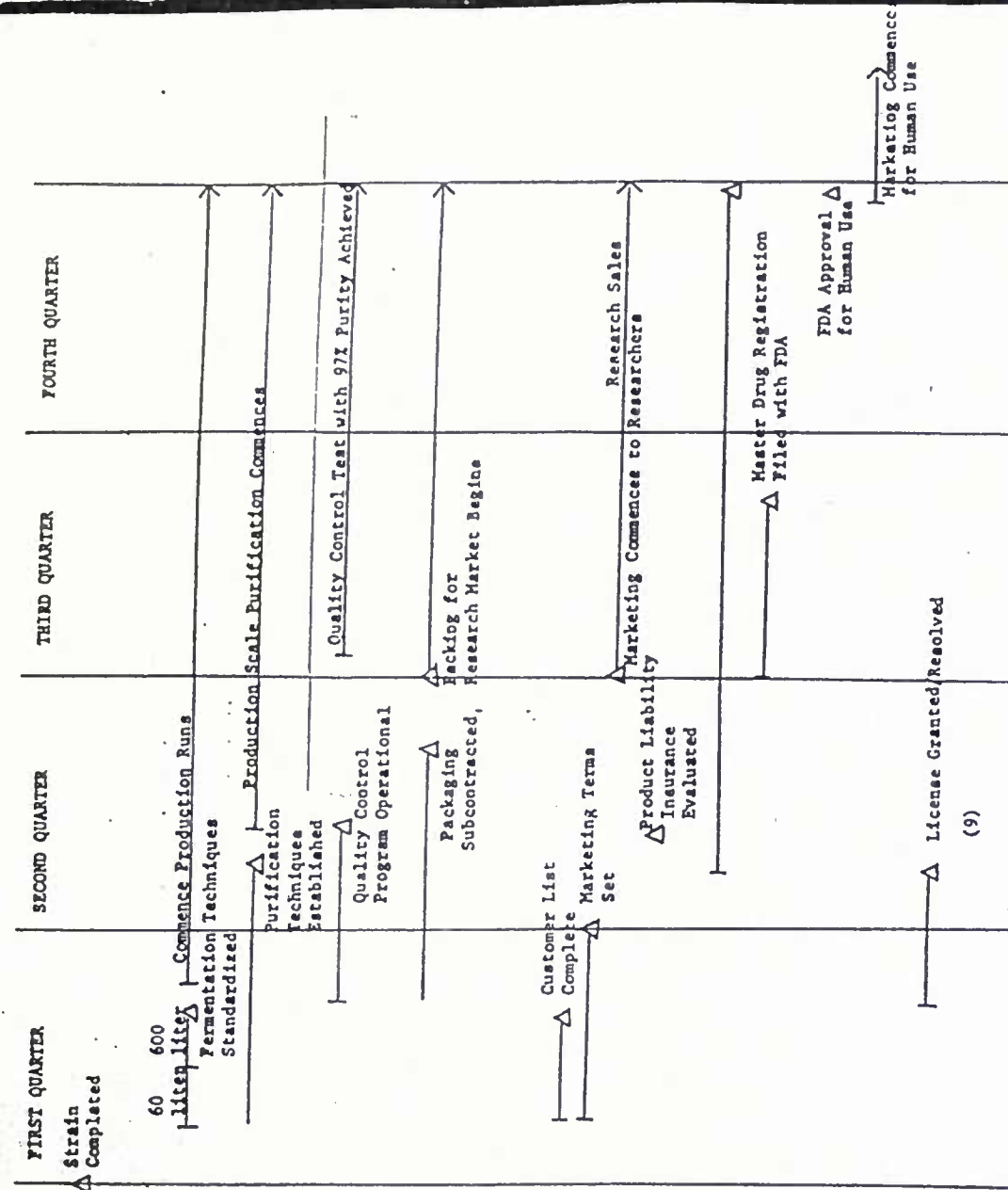
Genentech's own product development efforts will be concentrated on new products entering new markets (e.g., interferon, thymosin) or on new products for entering existing markets (e.g., HGH, insulin). In these cases Genentech will most likely maintain a technical or an economic competitive advantage, and the market potential for new products is large.

- E. In 1979 a plan will be developed and implemented to raise additional equity capital to finance plant and facilities expansion beyond the South San Francisco facility, to cover the costs of clinically testing new drugs for FDA approval and to build a marketing organization to sell the company's products.

Hand Book B,

GENENTECH PRODUCT DEVELOPMENT SUMMARY

PRODUCT DEVELOPMENT	1979				1980				1981	1982	1983	1984	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q					
INSULIN	Scale Up Production				/liter Benchmark Achieved				Human Insulin Approved by FDA	Human Insulin Production and Sales by Lilly			
THYMOSIN	Thymosin R & D				Scale Up Production, Clinical Trials & Research Sales				Thymosin Commence Sales			Sales Commence to Therapeutic Market	
	Strain Developed				Thymosin Commence Sales							FDA Approval	
	R & D				Scale Up Production for Clinical Trials				Research Sales and Sales				Sales Commence to Therapeutic Market
INTERFERON	R & D				Interferon Producing Strain Developed								FDA Approval
	R & D				Production Scale Up & Testing				Research Sales				Sales Commence to Therapeutic Market
	HGH Strain Developed												FDA Approval
HUMAN GROWTH HORMONE									(7)				



- IV. PRODUCT DEVELOPMENT
- A. DEVELOPMENT OF STRAIN PRODUCING SOMATOSTATIN
- B. PRODUCTION
1. FERMENTATION OF SOMATOSTATIN STRAIN
 2. PURIFICATION AND SEPARATION -
 - Develop Recovery Procedures
 3. QUALITY CONTROL
 - Establish Quality Control Program
 4. PACKAGING
 - Determine Packaging Requirements and Locate Subcontractor for Small Lots Packaging
- C. MARKETING
1. RESEARCH MARKET
 - Develop Customer List
 - Establish Marketing Terms
 - Commence Marketing to the Research Market
 - Product Liability Insurance
 2. THERAPEUTIC MARKET
 - Document Good Manufacturing Practices.
 - File Master Drug File Registration with FDA for Investigational New Drug (IND)
 - FDA Approves Genentech Production Process-Somatostatin for Human Use
 - Commence Marketing to Human Clinical Research Market
 3. DETERMINE LICENSING REQUIREMENTS

(9)

V. DEPARTMENTAL PLANS

A. 1979 PLAN FOR RESEARCH AND DEVELOPMENT1. MISSION

- A. To maintain scientific leadership in the field of molecular biology.
- B. To acquire additional skills necessary to assure Genentech has sufficiently broad based technical capabilities to maintain its unique leadership position.
- C. To develop microorganisms capable of producing new useful products.
- D. To foster a tradition of scientific excellence and professionalism.

2. GOALS AND OBJECTIVES FOR 1979

- A. To obtain bacterial expression in plantworthy microorganisms of:
 - 1. Human growth hormone - July 1, 1979
 - 2. Thymosin - July 1, 1979
 - 3. Interferon - January 1, 1980
 - 4. One additional product - January 1, 1980
- B. To engineer unique strains and plasmids for efficient production of protein products.
- C. To create a cloning vehicle and to obtain expression of desired proteins in yeast and begin familiarization with other non-E. coli microorganisms by year end.
- D. To develop cell culture and cellular immunology expertise.
- E. To build a functioning organizational framework for fostering project management and scientific communication.

RESEARCH AND DEVELOPMENTPersonnel Plan - 1979

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<u>ON BOARD:</u>												
<u>Organic Chemistry</u>												
<u>Approx. Salary</u>												
Director of Organic Research, Roberto Crea												
Scientist, Josi Shapiro												
Scientist, Ron Wetzel												
Technician, Mark Vasser												
Technician, Parkash Jhurani												
<u>Biochemistry</u>												
Scientist, David V. Goettel												
Scientist, Dennis G. Kleid												
Scientist, Herbert L. Heyneker												
Scientist, Giuseppe Miozzari												
Scientist, Michael J. Ross												
Scientist, Peter Seeburg												

RESEARCH AND DEVELOPMENT

Personnel Plan - 1979 - Page 2

ON BOARD: Biochemistry Approx. Salary Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Scientist,
Daniel Yansura

Scientist,
Paco Bolivar

Technician,
Frances Fields

Technician,
Alana Gray

Media Preparation
Dale Cullins

Dishwasher
Rick Samuelson

NEW HIRES:

Organic Chemistry

Scientist

Biochemistry Div.

Microbiologist

\$30K

Cellular

Immunologist

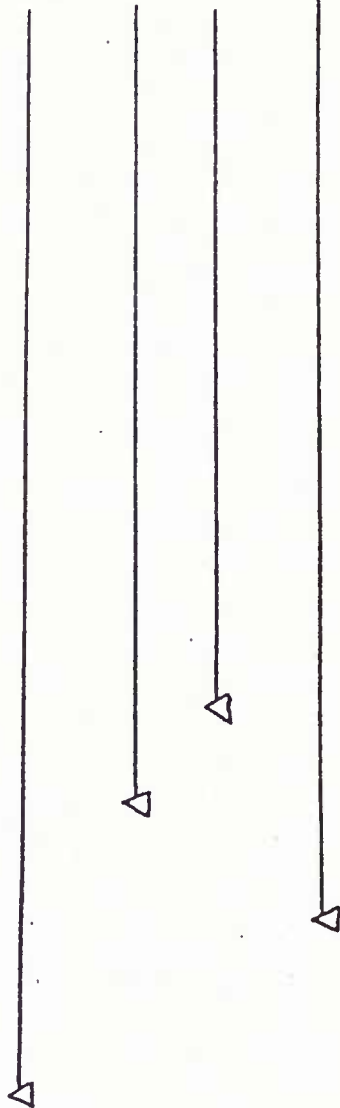
\$30K

Post Doctoral

Associate

\$15K

"MASKED"



V. DEPARTMENTAL PLANS

A. 1979 PLAN FOR RESEARCH AND DEVELOPMENT1. MISSION

- A. To apply newly developed recombinant DNA and related technologies for the creation of microorganisms capable of producing useful products.
- B. To acquire additional skills necessary to assure Genentech has sufficiently broad based technical capabilities to maintain its unique leadership position.
- C. To establish and maintain a tradition of scientific excellence and professionalism.

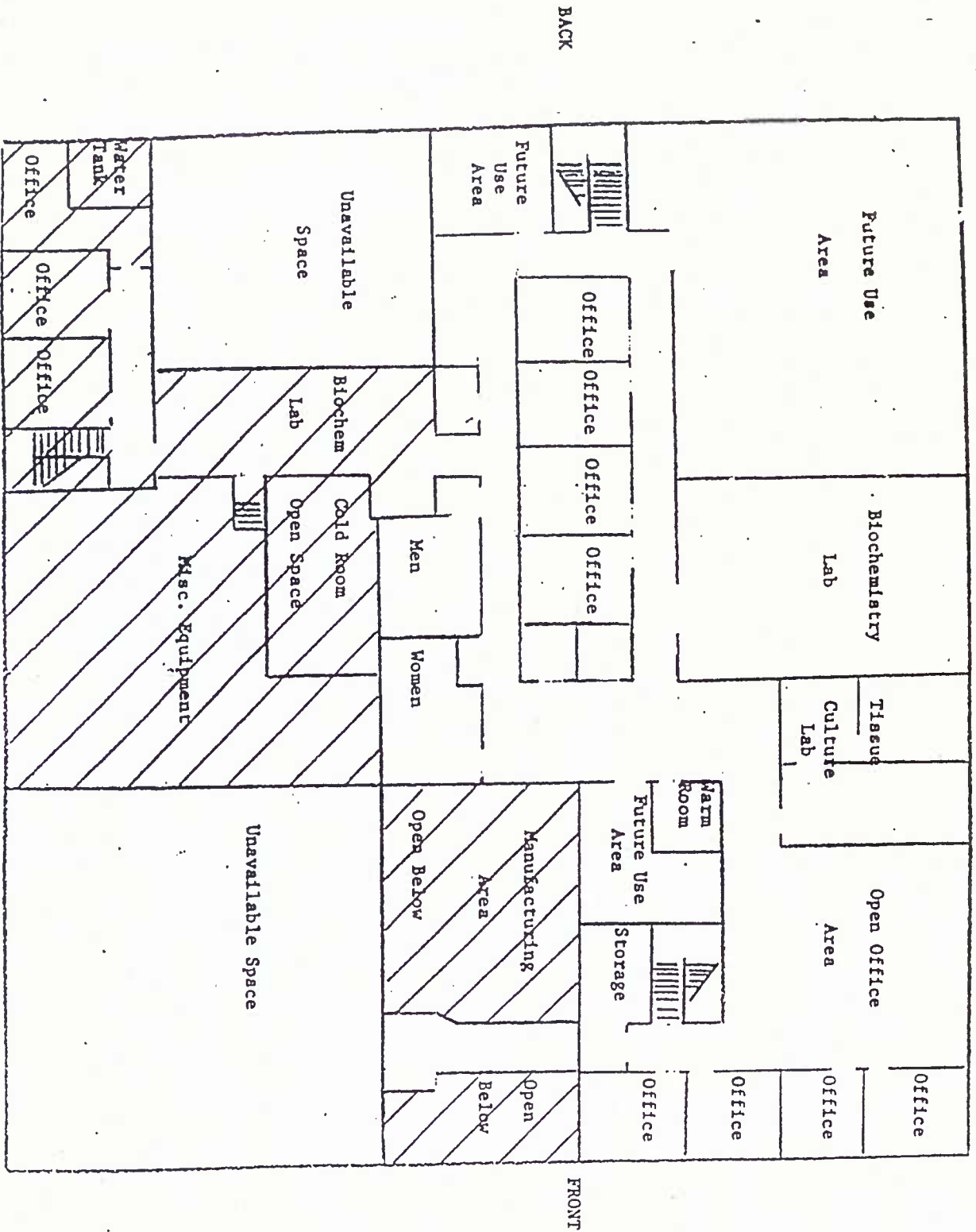
2. GOALS AND OBJECTIVES FOR 1979/1980

- A. To exploit synthetic DNA capability for:
 1. Total synthesis of DNA coding for α -thymosin by June 1, 1979.
 2. Manufacturing of restriction endonuclease linkers (Pst, Kpn) to facilitate the construction of new plasmids by June 1, 1979. (For explanation, see Section D.)
 3. Construction of probes for ACTH m-RNA isolation and for analysis of genomic DNA by October 1, 1979.
- B. To obtain bacterial expression in plantworthy microorganisms of:
 1. Somatostatin by June 1, 1979.
 2. Human growth hormone by July 1, 1979.
 3. α -thymosin by August 1, 1979.
 4. Interferon monoclonal antibodies by November 1, 1979.
 5. Hepatitis surface antigen by January, 1980.
 6. β -endorphin or other product by January 1, 1980 (in collaboration with City of Hope National Medical Center).
 7. Interferon by April, 1980.
- C. To develop a procedure for purifying the following proteins from E. coli cell paste:
 1. Insulin A chain and Insulin B chain by June 25, 1979.
 2. Insulin BCA by October 1, 1979.
 3. Somatostatin by October 1, 1979.
 4. Human Growth Hormone by January 1, 1980.
 5. α -thymosin by January 1, 1980.

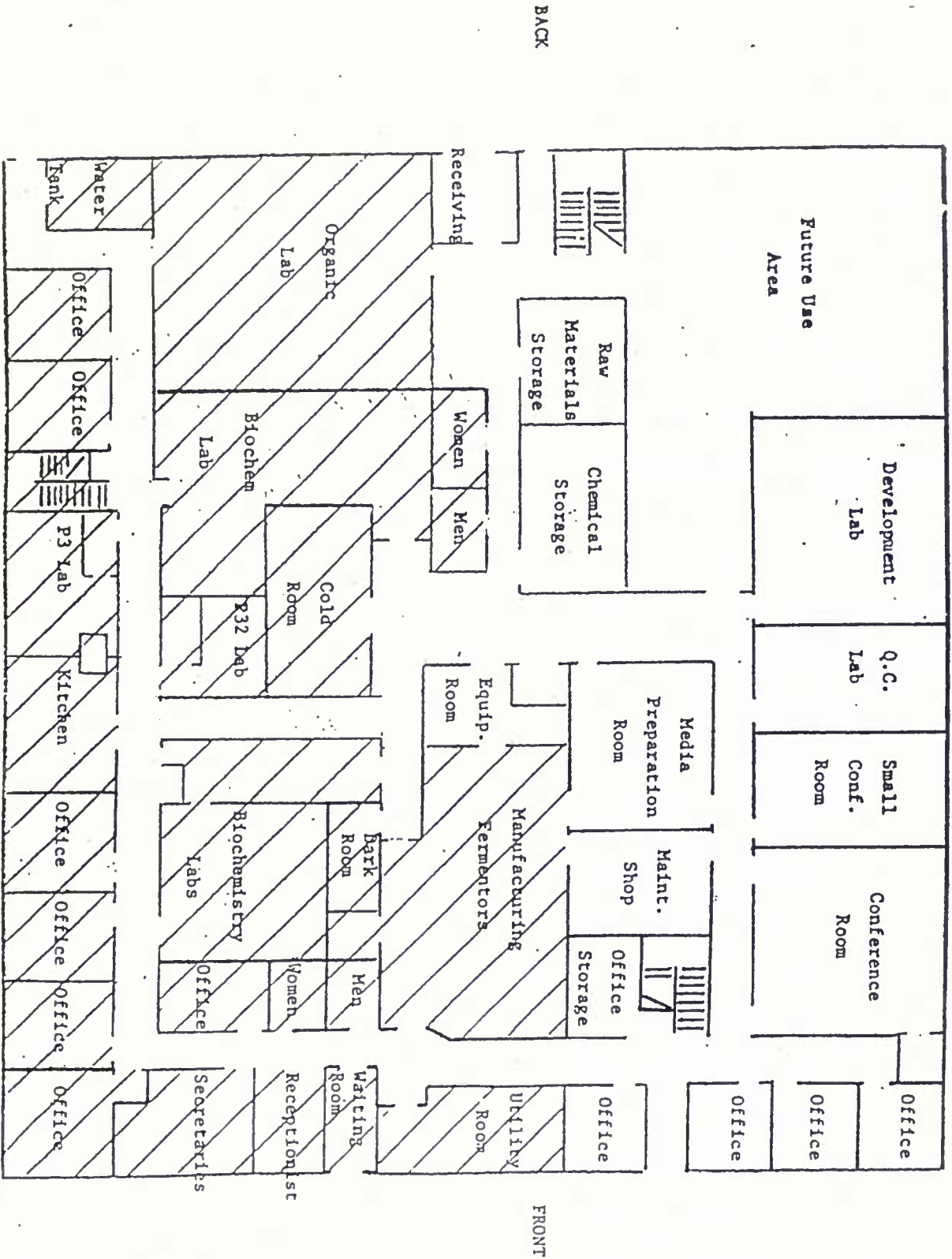
- D. To engineer unique bacterial strains and plasmids for efficient production of proteins.
1. Plasmids pKB432 and pKB433 were obtained by May 1, 1979. These plasmids can be used to express any DNA sequence starting with the initiation triplet ATG-.
 2. Derivatives of the plasmids pKB432 and pKB433, which can be used to obtain maximum expression of any DNA sequence, will be completed by July 1, 1979.
- E. To develop cellular biology expertise.
1. Biological assay for Interferon by May 1, 1979.
 2. Develop hybridoma techniques to obtain monoclonal antibodies.
- F. To expand protein chemistry expertise.
- G. To stimulate basic research in areas related to commercially applicable products.
1. In order to obtain a better understanding of organization and function of eukaryotic genes and to isolate DNA sequences coding for valuable proteins, the following project is initiated: Cloning and analysis of genomic DNA coding for insulin, glucagon, ACTH, human growth hormone, HCS, IGF 1 and 2, relaxin, nerve growth factor, secretin, gastrin, and β -endorphin. Using cloned chromosomal genes as probes, specific c-DNA's from c-DNA colony banks can be identified. The thymidine kinase gene from herpes simplex virus will be studied in more detail and developed into a eukaryotic cloning vehicle.
 2. Expand and develop new DNA and RNA synthesis techniques including enzymatic and solid-support approaches.
 3. Initiate studies aimed at the expression of valuable products in yeast. This involves establishing yeast DNA and c-DNA clone banks, the identification and characterization of a gene containing a strong promoter, and its use in the construction of cloning vehicles that allow for the efficient expression of foreign DNA sequences in yeast.
 4. Initiate studies aimed at the development of a Bacillus subtilis cloning system for the excretion of products into the medium.
 5. Initiate a project to better understand stability and solubility of fusion proteins in E. coli using A chain insulin fusion proteins as a model.

6. Develop model peptide substitutes and test various candidates for "restriction" proteases for cleaving peptides from leader peptides.
 7. Develop a project to study glycosilation of proteins in vitro.
- H. To maintain a functional organizational framework for fostering project management and scientific communication.

CROSS-HATCHED AREAS INDICATE PRESENTLY DEVELOPED SPACE



FIRST FLOOR
CROSS-HATCHED AREAS INDICATE PRESENTLY DEVELOPED SPACE



98/5: Acceptance speech, Stanford Bus. Schl.
 Entrepreneurial Co. of the Yr. Award

2238F/0112

Final, as given
 with Bob's editing

STANFORD SPEECH

SWANSON'S REMARKS:

BEFORE I GET INTO MY REMARKS, I JUST WANT TO SAY THAT OVERALL, I'M PLEASED TO HAVE HERB AS CO-FOUNDER OF GENENTECH. HERB AND I HAVE GOTTEN ALONG WELL TOGETHER. WE AGREE ON MOST THINGS. BUT, WATCHING HIM SPEAK TONIGHT REMINDS ME THAT WE STILL HAVEN'T STARTED WORK ON AN IMPORTANT PRODUCT THAT WAS NEAR THE TOP OF MY LIST.

FOR REASONS THAT SHOULD BE CLEAR IF YOU LOOK AT MY--UH--HIGH FOREHEAD, I FELT WE SHOULD CONCENTRATE ON HAIR GROWTH HORMONE. HERB (FOR OBVIOUS REASONS) NEVER SAW THAT AS A HIGH-PRIORITY PROBLEM.

SINCE HERB TALKED ABOUT THE FORMATION OF GENENTECH FROM A SCIENTIST'S PERSPECTIVE, I'D LIKE TO LOOK AT IT NOW FROM A BUSINESSMAN'S POINT OF VIEW.

WHAT WE DID

JUST EIGHT YEARS AGO, I WAS A PARTNER IN THE VENTURE CAPITAL FIRM OF KLEINER & PERKINS, INVESTING IN SMALL HIGH TECHNOLOGY COMPANIES. I WAS WORKING ONLY AT THE BOARD LEVEL, TO HELP THOSE COMPANIES DIRECT THEIR GROWTH AND AVOID TYPICAL SMALL COMPANY MISTAKES. I WAS ALSO GATHERING VALUABLE EXPERIENCE ABOUT THE RIGHT THINGS TO DO IN STARTING A COMPANY. HERB CALLS IT MY POST-DOCTORATE TRAINING.

-2-

I FIRST BECAME INTRIGUED BY THE COMMERCIAL POTENTIAL OF RECOMBINANT DNA TECHNOLOGY IN 1975. HAVING BEEN A CHEMISTRY MAJOR IN COLLEGE, I HAVE A LONG STANDING INTEREST IN SCIENCE AND HAD READ A NUMBER OF IMPRESSIVE TECHNICAL PAPERS BY DR. BOYER AND OTHERS.

IT SEEMED TO ME THAT GENETIC ENGINEERING WAS RIPE FOR COMMERCIAL APPLICATION. BUT WHEN I TALKED WITH A NUMBER OF BUSINESSMEN AND SCIENTISTS, NO ONE WAS WILLING TO AGREE.

THEY DIDN'T SAY: "WELL, GEE, IF THIS ELEMENT OF THE TECHNOLOGY COULD JUST BE SOLVED, IT COULD PRODUCE PRODUCTS." THEY'D JUST SAY THAT COMMERCIALIZATION WAS TEN TO TWENTY YEARS DOWN THE ROAD. WHEN I PRESSED THEM FOR REASONS, NO ONE HAD ANY GOOD ANSWERS.

BY JANUARY OF 1976, I WAS REALLY IMPATIENT. DR. BOYER WAS CLEARLY AT THE FOREFRONT OF THE RESEARCH -- AND I DECIDED TO GIVE HIM A CALL. WE'D NEVER MET BEFORE. HE TOLD ME HE WAS VERY BUSY -- HE WAS FRIENDLY, BUT BUSY. HE AGREED TO GIVE ME 10 MINUTES OF HIS TIME ON A FRIDAY AFTERNOON.

WELL, THAT 10 MINUTES EXTENDED INTO THREE HOURS...AND AT LEAST AS MANY BEERS. AND I CAN'T BE SURE IN RETROSPECT WHETHER IT WAS MY PERSUASIVENESS, HIS ENTHUSIASM, OR THE EFFECT OF THE BEERS, BUT WE AGREED, THAT NIGHT, TO ESTABLISH A PARTNERSHIP TO INVESTIGATE THE COMMERCIAL FEASIBILITY OF RECOMBINANT DNA TECHNOLOGY.

Killy's final change

-3-

THERE'S ALWAYS AN ELEMENT OF LUCK IN SUCH THINGS. AND I WAS LUCKY. JUST ^{FROM} PRIOR TO MY CONTACT WITH HERB, HE HAD COLLABORATED ON A RESEARCH PROJECT WHICH ^{WHICH} ~~MEANT WE COULD TAKE THE TECHNOLOGY TO THE NEXT STEP~~ ^{MIGHT BE TAKEN A} -- PRODUCTION OF A USEFUL PRODUCT. ^{FURTHER TO}

LESS THAN THREE MONTHS LATER, IN APRIL 1976, WE FORMED GENENTECH.

FOR THOSE OF YOU WHO ARE UNFAMILIAR WITH GENETIC ENGINEERING, WHAT WE ARE WORKING WITH IS DNA -- THE GENETIC MATERIAL OF LIVING CELLS WHICH IS PASSED ON FROM ONE GENERATION TO THE NEXT. DNA CONTAINS THE MASTER PLAN OF LIFE.

GENES ARE JUST SEGMENTS OF DNA. THEY DETERMINE OUR PHYSICAL CHARACTERISTICS -- BROWN EYES, BLOND HAIR, MALE, FEMALE -- AND MOST IMPORTANTLY, THEY ARE RESPONSIBLE FOR GIVING OUR BODIES INSTRUCTIONS FOR MAKING PROTEINS SUCH AS HORMONES AND ENZYMES WHICH ENABLE US TO FUNCTION NORMALLY.

WHAT WE WERE PROPOSING TO DO FOR THE FIRST TIME WAS TAKE A HUMAN GENE; SPLICE IT INTO THE DNA OF A COMMON BACTERIA; AND TO DO THIS IN SUCH A WAY THAT THE BACTERIA ACCEPTED THE DNA AS ITS OWN, FOLLOWED THE INSTRUCTIONS ON THE GENE, AND PRODUCED THE DESIRED PROTEIN.

OUR FIRST ORDER OF BUSINESS AT GENENTECH WAS TO PROVE THAT IT WAS POSSIBLE AND COMMERCIALY FEASIBLE TO GET A BACTERIA TO MAKE A HUMAN PROTEIN. NOBODY HAD DONE IT BEFORE.

-4-

WE STARTED OUT CAUTIOUSLY. WE RENTED EVERYTHING -- OFFICE SPACE, FURNITURE, EVEN A PART-TIME SECRETARY. WE HAD NO ASSETS. THERE WAS JUST HERB AND ME -- AND HERB ALSO HAD OBLIGATIONS AS A PROFESSOR AT THE UNIVERSITY OF CALIFORNIA AT SAN FRANCISCO. KLEINER & PERKINS AGREED TO PROVIDE THE FIRST \$100,000 IN VENTURE CAPITAL FUNDING, WHICH LASTED US NINE MONTHS. TOM AND EUGENE ARE IN THE AUDIENCE. I WANT TO PUBLICLY THANK ^{YOU} ~~THEM~~ FOR ^{YOUR} ~~THEIR~~ FAITH. THIS WAS THE FIRST TIME THEIR FIRM INTENTIONALLY FUNDED BASIC RESEARCH.

WE CONTRACTED WITH UNIVERSITIES TO DO THE EARLY RESEARCH. IT WAS BASIC RESEARCH THAT FIT WELL INTO A UNIVERSITY ENVIRONMENT AND WAS A GOOD EXAMPLE OF THE VALUABLE INTERACTION BETWEEN BUSINESS AND UNIVERSITIES. THE EXCLUSIVE MARKETING RIGHTS WE RECEIVED ARE NOW GENERATING ROYALTY INCOME TO THE UNIVERSITIES.

WE KNEW THAT THE ROAD TO SUCCESS WOULD NOT BE EASY, BUT THERE WAS ONE THING WE DID IN THOSE DAYS WHICH WAS EASY. WHILE DISCUSSING WHAT TO CALL THE COMPANY, I SUGGESTED "HERBOB." I CAN SEE YOU AGREE WITH HERB. HE ^{ALSO} ~~HE~~ ~~THOUGHT~~ THAT WAS TERRIBLE. IN ONE OF THE FLASHES OF BRILLIANCE FOR WHICH HE IS FAMOUS, HE IMMEDIATELY CAME UP WITH GENENTECH, ..SHORT FOR GENETIC ENGINEERING TECHNOLOGY. IT SEEMED LIKE A TERRIFIC NAME, AND THE ENTIRE PROCESS TOOK MAYBE 10 SECONDS.

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ONE YEAR AFTER OUR FOUNDING, IN 1977, GENENTECH WAS ABLE TO ANNOUNCE THE SUCCESSFUL BACTERIAL PRODUCTION OF THE HUMAN BRAIN HORMONE, SOMATOSTATIN. THIS WAS A SIGNIFICANT BREAKTHROUGH -- THE FIRST USEFUL PRODUCT MADE BY GENETIC ENGINEERING.

WE WERE ACTUALLY AHEAD OF SCHEDULE. FROM START TO FINISH, THE RESEARCH TOOK JUST SEVEN MONTHS. THAT CAUGHT MANY BY SURPRISE -- ESPECIALLY THE VENTURE CAPITALISTS WHO WANTED AN OPPORTUNITY TO INVEST MORE MONEY AT A LOW PRICE.

IN RECOGNITION OF THIS ACCOMPLISHMENT, PHILIP HANDLER, THE PRESIDENT OF THE NATIONAL ACADEMY OF SCIENCES, HAILED THE DEVELOPMENT AS "A SCIENTIFIC TRIUMPH OF THE FIRST ORDER." AND STANFORD'S PAUL BERG, WHO WOULD LATER BECOME A NOBEL LAUREATE, CALLED IT "ASTONISHING."

NOW THAT WE HAD PROVEN THE TECHNOLOGY, WE FELT COMFORTABLE INVESTING IN PEOPLE AND FACILITIES. BUT FINDING THE RIGHT PEOPLE WAS DIFFICULT. AT THE TIME, MOST MOLECULAR BIOLOGISTS ENGAGED IN RECOMBINANT DNA RESEARCH WOULDN'T EVEN CONSIDER WORKING FOR INDUSTRY. THEY WANTED A PROFESSORSHIP AT STANFORD...OR EVEN ONE AT A LESSOR-KNOWN UNIVERSITY.

OUR FIRST SCIENTIST WAS FROM HOLLAND. AS A POST-DOC, HE HAD DONE MUCH OF THE WORK IN HERB BOYER'S LAB, AND THEN RETURNED HOME. HERB AND I HAD TO GO TO HOLLAND AND BRING HIM BACK. HERB HEYNEKER IS HERE TONIGHT, ALONG WITH OTHER GENENTECH SCIENTISTS WHO JOINED US EARLY ON.

OF COURSE, TODAY IT'S CONSIDERABLY EASIER TO HIRE SCIENTISTS AND OTHER PROFESSIONALS. WE GET ROUGHLY 500 UNSOLICITED RESUMES A MONTH.

AFTER OUR SUCCESS WITH SOMATOSTATIN, WE NEXT TACKLED THE PRODUCTION OF HUMAN INSULIN. AGAIN ONE YEAR LATER, IN 1978, GENENTECH ANNOUNCED THAT MICROORGANISMS HAD BEEN ENGINEERED TO PRODUCE THE PRODUCT. FOUR YEARS LATER, IN THE FALL OF 1982, HUMAN INSULIN BECAME THE FIRST PHARMACEUTICAL PRODUCT OF RECOMBINANT DNA TECHNOLOGY TO RECEIVE MARKETING CLEARANCE FROM THE FDA. TODAY IT IS BEING MANUFACTURED AND MARKETED BY ELI LILLY, UNDER CONTRACT FROM GENENTECH.

FOUR YEARS FROM DISCOVERY TO MARKET IS LIGHTNING SPEED FOR A PHARMACEUTICAL. BUT COMPARED TO OTHER HIGH TECHNOLOGY PRODUCTS, IT'S A VERY LONG TIME. BECAUSE OF THIS LEAD TIME FACTOR IN OUR INDUSTRY, GENENTECH HAS HAD TO ADOPT SOME UNIQUE STRATEGIES ... A FEW OF WHICH I'LL SHARE WITH YOU LATER.

SINCE OUR FOUNDING, THE INDUSTRY HAS ADVANCED RAPIDLY. TODAY, A VARIETY OF GENENTECH PRODUCTS ARE NOW MOVING STEADILY TOWARD THE MARKETPLACE. TO NAME A FEW: HUMAN GROWTH HORMONE, TO ENABLE DWARFS TO GROW TO NORMAL HEIGHT. TISSUE-TYPE PLASMINOGEN ACTIVATOR, TO DISSOLVE BLOOD CLOTS CAUSING HEART ATTACKS AND OTHER LIFE-TREATENING CONDITIONS. GAMMA INTERFERON, WHICH WE BELIEVE TO BE AN EFFECTIVE AGENT AGAINST A NUMBER OF CANCERS AND VIRAL DISEASES.

ALL TOGETHER WE'VE ALREADY ANNOUNCED FOURTEEN GENENTECH PRODUCTS, WHICH ARE IN VARIOUS STAGES OF DEVELOPMENT FOR USE AS HUMAN PHARMACEUTICALS, ANIMAL HEALTH PRODUCTS AND INDUSTRIAL ENZYMES. MANY OTHER PRODUCTS ARE UNDER

DEVELOPMENT. NONE OF THESE PRODUCTS WOULD HAVE BEEN POSSIBLE WITHOUT RECOMBINANT DNA TECHNOLOGY.

WE HAVE GROWN TO 240,000 SQUARE FEET OF FACILITIES, INCLUDING A MAJOR NEW 72,000 SQUARE FOOT MANUFACTURING PLANT -- AND WE ARE MANUFACTURING CLINICAL GRADE PRODUCT ON A THREE-SHIFT BASIS. WE HAVE MORE THAN 460 EMPLOYEES -- ONE IN FIVE HAS A PH.D. WE ENDED 1982 WITH OVER \$100 MILLION IN ASSETS, INCLUDING CASH IN EXCESS OF \$35 MILLION.

TO GET TO THIS POINT, WE'VE FACED SOME UNUSUAL BUSINESS CHALLENGES DUE TO THE NATURE OF OUR TECHNOLOGY AND PRODUCTS. SINCE THESE CHALLENGES ARE DIFFERENT FROM THOSE MANY OF YOU HAVE EXPERIENCED IN OTHER BUSINESSES, I THOUGHT THE STRATEGIES WE HAVE ADOPTED WOULD BE OF INTEREST TO YOU.

FOCUSED BUSINESS STRATEGY

PERHAPS MOST IMPORTANT IS OUR FOCUSED BUSINESS APPROACH.

BIOTECHNOLOGY OFFERS PROMISING OPPORTUNITIES IN SO MANY FIELDS THAT IT IS EASY TO BE LIKE A KID IN THE CANDY STORE -- DOING A LITTLE OF THIS AND A LITTLE OF THAT. BUT AS DAVE PACKARD REMINDS ME IN OUR BOARD MEETINGS, NOT MANY COMPANIES RUN INTO PROBLEMS BECAUSE OF STARVATION. IT'S THE INDIGESTION THAT GETS TO THEM. WE HAVE TAKEN HIS ADVICE.

-8-

BRINGING A PRODUCT FROM THE LABORATORY TO THE MARKETPLACE TAKES ENORMOUS ENERGY, AND CONCENTRATION OF BOTH HUMAN AND CAPITAL RESOURCES. WE RECOGNIZED EARLY ON THAT IT IS IMPORTANT TO FOCUS ON DOING A FEW THINGS WELL -- FIRST DEVELOPING PRODUCTS IN ONE AREA BEFORE EXPANDING INTO ANOTHER.

INITIALLY, GENENTECH RESOURCES WERE CHANNЕLED INTO HEALTH CARE PRODUCTS -- ESPECIALLY PROTEINS WITH IMPORTANT THERAPEUTIC POTENTIAL. THESE PRODUCTS WERE CHOSEN FOR THEIR SCIENTIFIC FEASIBILITY... POTENTIALLY LARGE MARKET SIZE AND HIGH PROFIT MARGINS ... OPPORTUNITY FOR EARLY MARKET ENTRY ... AND CLEAR COMPETITIVE EDGE.

HOWEVER, EVEN WITHIN PHARMACEUTICALS, WE HAD TO DECIDE WHICH AREAS WE WOULD BE IN, AND WHICH AREAS WE WOULD NOT BE IN, (FOR EXAMPLE, WE CHOSE NOT TO BE IN THE DIAGNOSTICS BUSINESS.) WE FOCUSED ON ETHICAL DRUGS.

WITHIN THE ETHICAL DRUGS CATEGORY, WE CONCENTRATED EVEN FURTHER ON PRODUCTS PRESCRIBED BY MEDICAL SPECIALISTS. EARLY ON WE FELT WE COULDN'T SERVE WELL THE MORE THAN 400,000 DOCTORS PRACTICING IN THE U.S. BUT SPECIALIST MARKETS ARE WITHIN OUR REACH. AND BECAUSE MOST SPECIALISTS ARE BASED AT THE ROUGHLY 900 MAJOR HOSPITALS NATIONWIDE, THEY CAN BE REACHED EFFICIENTLY. FOR EXAMPLE, A SALEPERSON COULD VISIT A HOSPITAL, SEE AN ENDOCRINOLOGIST ABOUT HUMAN GROWTH HORMONE, THEN WALK UPSTAIRS TO SEE A CARDIOLOGIST ABOUT TISSUE-TYPE PLASMINOGEN ACTIVATOR, AND GO DOWN THE HALL TO SEE AN INTERNIST ABOUT GAMMA INTERFERON.

-9-

ONLY A SMALL SALES FORCE IS NEEDED, AND GENENTECH IS NOT AT A DISADVANTAGE COMPARED WITH A PHARMACEUTICAL GIANT.

TO MARKET OUR PRODUCTS OUTSIDE OF THE U.S., WE HAVE ARRANGED MARKETING AGREEMENTS WITH FOREIGN PHARMACEUTICAL COMPANIES -- INCLUDING SEVERAL JAPANESE COMPANIES. BUT, WE HAVE NOT LICENSED OUR TECHNOLOGY TO THEM. WHILE THESE COMPANIES WILL CONDUCT THE CLINICAL TRIALS IN PREPARATION FOR MARKETING IN THEIR AREAS, WE HAVE RETAINED MANUFACTURING RIGHTS AND SELL THE PRODUCTS TO ~~THEM~~ ~~OUR CONTRACT PARTNERS~~ IN BULK FORM.

BESIDES PHARMACEUTICALS, OUR PRODUCT DEVELOPMENT CATEGORIES HAVE RECENTLY BROADENED TO INCLUDE ANIMAL HEALTH PRODUCTS -- A NATURAL EXTENSION OF THE COMPANY'S EXPERTISE IN HUMAN PHARMACEUTICALS -- AND INDUSTRIAL ENZYMES.

FINANCIAL STRATEGY

~~OF COURSE,~~ A LITTLE INNOVATION IN THE FINANCIAL AREA ^{ALWAYS} HELPS. HOW ELSE COULD GENENTECH MANAGE FOUR YEARS OF PROFITABILITY, OVER 50 PERCENT ANNUAL GROWTH AND '82 REVENUES OF \$32.6 MILLION WITHOUT SELLING A SINGLE PRODUCT TO A DOCTOR OR HIS PATIENTS?

SERIOUSLY, ENTRY INTO THE ETHICAL DRUG BUSINESS TAKES SUBSTANTIAL FINANCIAL RESOURCES. TYPICALLY, A NEW PHARMACEUTICAL REQUIRES \$50 MILLION AND 7 YEARS OF RESEARCH AND HUMAN TESTING. ON THE OTHER HAND, ONCE WE ARE SELLING

-10-

A PRODUCT, WE HAVE CROSSED MANY HIGH BARRIERS; AND OUR COMPETITION MUST COVER THE SAME GROUND TO CATCH UP.

GENENTECH'S STRATEGY HAS BEEN TO INTENTIONALLY OPERATE JUST OVER BREAK-EVEN DURING OUR NECESSARILY LENGTHY PRODUCT DEVELOPMENT PERIOD. RATHER THAN USE EQUITY CAPITAL TO FUND OUR R&D (WHICH WAS \$25 MILLION LAST YEAR), WE HAVE FINANCED OUR DAY-TO-DAY OPERATING EXPENSES PRIMARILY WITH OPERATING REVENUES FROM COLLABORATIVE RESEARCH, LICENSING FEES AND PRODUCT SALES TO OUR CORPORATE PARTNERS FOR CLINICAL USE.

WE STILL HAVE REQUIRED LOTS OF CASH. SINCE ITS FOUNDING, GENENTECH HAS RAISED \$155 MILLION -- \$12 MILLION FROM VENTURE CAPITAL, 7 IN DEBT FINANCING, 36 FROM OUR PUBLIC OFFERING, 45 FROM PRIVATE PLACEMENTS WITH CORPORATE INVESTORS, AND 55 FROM A PRIVATE RESEARCH AND DEVELOPMENT LIMITED PARTNERSHIP.

WE HAD TWO MOTIVES FOR GOING PUBLIC WHEN WE DID. FIRST: WE KNEW WE WOULD NEED MORE MONEY THAN VENTURE CAPITAL COULD SUPPLY -- AND LONG BEFORE WE HAD PRODUCTS TO SELL. SECOND: GENENTECH WAS SETTING STANDARDS IN THE INDUSTRY; AND WE WANTED TO ESTABLISH A RECORD OF BUSINESS ACCOMPLISHMENTS THAT OTHER BIOTECHNOLOGY COMPANIES WOULD HAVE TO MATCH.

IN PRIVATE EQUITY PLACEMENTS, WE HAVE ACTIVELY SOUGHT CORPORATE SHAREHOLDERS WHO COULD CONTRIBUTE MORE THAN MONEY TO OUR COMPANY. THEY

-II-

INCLUDE: JAPANESE FINANCIAL INSTITUTIONS, WHO ARE HELPING OUR JAPANESE SUBSIDIARY GAIN A Foothold IN JAPAN (JAPAN IS THE SECOND LARGEST PHARMACEUTICAL MARKET IN THE WORLD); CORNING GLASS WORKS, OUR PARTNER IN GENENCOR, A JOINT COMPANY FOR THE PRODUCTION OF INDUSTRIAL ENZYMES; FLUOR, WHOSE SUBSIDIARY SPECIALIZING IN PHARMACEUTICAL PLANT CONSTRUCTION HELPED US DESIGN AND BUILD OUR NEW MANUFACTURING FACILITY; ALFA-LAVAL, A LEADING SUPPLIER OF PURIFICATION AND EXTRACTION EQUIPMENT, VALUABLE FOR PROCESS SCALE-UP; AND LUBRIZOL, WITH EXPERTISE IN SPECIALTY CHEMICALS.

A MAJOR PIECE OF OUR FINANCING HAS COME FROM THE FORMATION OF PRIVATE R&D LIMITED PARTNERSHIPS, WHICH ARE AN IDEAL VEHICLE FOR FUNDING THE HIGH COSTS OF HUMAN CLINICAL TESTING. UNLIKE OTHER TYPES OF R&D PARTNERSHIPS, OURS FINANCE PRODUCTS THAT ARE ESSENTIALLY DEVELOPED, BUT MUST NOW FACE THE RIGORS AND EXPENSE OF HUMAN TESTING AND REGULATORY APPROVAL. THEY ARE PART OF THE MAINSTREAM OF OUR COMPANY.

THE PARTNERSHIPS ARE GOOD FOR BOTH SIDES. THEY PROVIDE A TAX WRITE-OFF AND EXCELLENT POTENTIAL RETURN FOR INVESTORS. AND THEY ALLOW GENENTECH TO RAISE THE FUNDS REQUIRED FOR CLINICAL TESTING WHILE RETAINING CONTROL OVER THE PRODUCT'S MANUFACTURING AND MARKETING. LIKE THE COLT 45 WAS TO THE OLD WEST, THEY ARE A GREAT EQUALIZER WHEN COMPETING WITH LARGE, WELL-FINANCED PHARMACEUTICAL COMPANIES.

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PEOPLE ORIENTATION

WHEN YOU COME RIGHT DOWN TO IT, THOUGH, INVESTMENT IN PEOPLE IS WHAT HAS MADE THE DIFFERENCE AT GENENTECH. WE'VE WORKED HARD AT A STRATEGY TO MAKE SURE OUR EMPLOYEES ENJOY COMING TO WORK EVERY DAY AND THAT THEY PARTICIPATE IN THE SUCCESS OF THE COMPANY. IT HAS PAID OFF -- NOT ONLY IN TERMS OF OUR BUSINESS ACHIEVEMENTS BUT ALSO IN TERMS OF EMPLOYEE MORAL. OUR TURNOVER RATE IS UNCHARACTERISTICALLY LOW -- ABOUT 1/2 OF ONE PERCENT PER MONTH.

EVERYONE IN THE COMPANY HAS AN OPPORTUNITY TO OWN SHARES OF GENENTECH'S STOCK -- MOST OF THEM ARE SHAREHOLDERS. IT IS OUR BELIEF THAT THOSE WHO ARE MAKING THINGS HAPPEN SHOULD SHARE SIGNIFICANTLY AS OUR BUSINESS GROWS.

WE'VE GONE AFTER THE BEST FOLKS WE COULD FIND ANYWHERE -- AND HAVE NOT BEEN LIMITED BY GEOGRAPHIC LOCATION. WE'VE STAFFED LEAN AND HAVE MAINTAINED A TIGHT FOCUS ON DAY-TO-DAY OPERATIONS. WE'VE INVOLVED A BROAD-BASED MIX OF SCIENTISTS AND BUSINESS PEOPLE IN OUR PLANNING AND DECISION-MAKING. (WE'VE EVEN HIRED A FEW STANFORD BUSINESS SCHOOL GRADUATES.)

GENENTECH'S RESEARCH ORGANIZATION IS AMONG THE LARGEST IN THE WORLD DEDICATED TO RECOMBINANT DNA TECHNOLOGY. WITH SOME 150 SCIENTISTS, IT IS ALSO ONE OF THE MORE ENTREPRENEURIAL GROUPS OF PEOPLE YOU ARE LIKELY TO COME ACROSS. WHAT ABOUT THE MANAGEMENT OF SUCH A CREW? IT'S EASY. WE DON'T WORK ON ANY PROJECTS WE CAN'T GET SOMEONE EXCITED ABOUT. (SOMETIMES IT TAKES LONGER THAN OTHERS, BUT WE NEVER CHANGE THAT RULE.)

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WHAT ABOUT TOO MUCH EXCITEMENT? ALMOST 70% OF GENENTECH'S RESOURCES ARE FOCUSED ON OUR TOP FIVE PROJECTS. IMPORTANT BUSINESS GOALS ARE SET AND IMPLEMENTED BY PROJECT TEAMS THAT CUT ACROSS DEPARTMENTS.

WE FEEL IT IS IMPORTANT THAT ONCE YOU'VE DEFINED "STRETCH" BUSINESS GOALS YOU ALLOW A LOOSENESS IN THE ORGANIZATION THAT ENABLES YOU TO ACHIEVE THOSE GOALS. THERE HAS TO BE ENOUGH FREEDOM AND TIME FOR PEOPLE TO FOLLOW THEIR NOSE ON NEW IDEAS. AND MANAGEMENT NEEDS TO "WALK AROUND" AND PAY ATTENTION TO WHAT'S MOTIVATING EMPLOYEES.

IN OUR BUSINESS, PUBLISHING RESEARCH IS IMPORTANT -- AFTER THE APPROPRIATE FILING OF PATENTS. SO FAR, 130 RESEARCH PAPERS ON OUR WORK HAVE BEEN PUBLISHED IN SCIENTIFIC JOURNALS. I KNOW THIS IS UNUSUAL FOR A COMPANY; BUT WE BELIEVE WE HAVE MORE TO GAIN FROM OUR INTERACTION WITH THE WORLD'S SCIENTIFIC COMMUNITY THAN WE STAND TO LOSE BY ALLOWING THIS INFORMATION TO FALL INTO THE HANDS OF OUR COMPETITION. SUCH INTERACTION ALSO IS CRITICAL TO ATTRACTING AND KEEPING THE VERY BEST SCIENTIFIC TALENT.

GENENTECH IS NOW WELL ON THE WAY TO BECOMING A MAJOR CORPORATION THAT MAKES AND SELLS SIGNIFICANT PRODUCTS.

WHAT WE ARE DOING NOW -- AS A COMPANY AND AS AN INDUSTRY -- IS ONLY THE TIP OF THE ICEBERG. AS THE INTERNATIONAL HERALD TRIBUNE SAID RECENTLY, "BIOTECHNOLOGY MAY BE TO THE 1980S AND BEYOND WHAT COMPUTERS HAVE BEEN SINCE THE 1960S -- THE BASIS OF A TECHNOLOGY THAT WILL CHANGE PEOPLE'S LIVES."

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I AGREE. WE ARE CREATING PRODUCTS THAT WOULD ^{NOT} BE ^{FEASIBLE} COMMERCIALY ~~IMPOSSIBLE~~ WITHOUT RECOMBINANT DNA TECHNOLOGY. AS FAR-REACHING AS IT MAY SEEM, PRODUCING THE RARE AND COMPLEX PROTEINS THAT ARE A NATURAL PART OF THE BODY'S SYSTEM FOR FIGHTING DISEASE AND MAINTAINING GOOD HEALTH IS ONLY THE BEGINNING. PRODUCTS EMANATING FROM BIOTECHNOLOGY WILL ULTIMATELY CHANGE FOREVER THE WAY WE TREAT DISEASES ... THE WAY WE CARE FOR LIVESTOCK AND CROPS ... THE WAY WE PROCESS FOOD AND CHEMICALS.

IN THE DECADES AHEAD, VIRTUALLY EVERY ASPECT OF OUR LIVES WILL BE TOUCHED BY BIOTECHNOLOGY -- AND IN WAYS WE CANNOT EVEN CONCEIVE OF TODAY.

THANK YOU FOR HONORING GENENTECH'S PART IN HELPING CREATE THIS EXCITING NEW FIELD.

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Genentech, Inc.
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KING OF SWEDEN PRESENTS GENENTECH PRESIDENT
WITH MEMBERSHIP IN ROYAL SWEDISH ACADEMY

SOUTH SAN FRANCISCO, CA, March 13, 1984 -- His Majesty King Carl XVI Gustaf of Sweden today presented Genentech president Robert A. Swanson with a certificate of membership in the prestigious Royal Swedish Academy of Engineering Sciences. The presentation took place during a visit to Genentech by the Royal Technology Mission to the U.S. West Coast.

The Royal Swedish Academy of Engineering Sciences is a Swedish national institution established for the purposes of promoting engineering and technical sciences and recognizing outstanding contributions to society. The membership of the Swedish Academy includes prominent engineers, scientists, economists, and leaders from both the private and public sectors.

Commenting on his nomination to the Academy, Mr. Swanson said: "This is a great honor for me, both personally and professionally. My ancestry is Swedish. In addition, Genentech has developed a number of strong relationships with major Swedish companies and has good Swedish investor support. I look forward to building our affiliations in Sweden."

Genentech, Inc. is a leading biotechnology company. It is focused on the development, manufacture and marketing of recombinant DNA products, principally for human and animal health.

-end-

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BusinessWeek

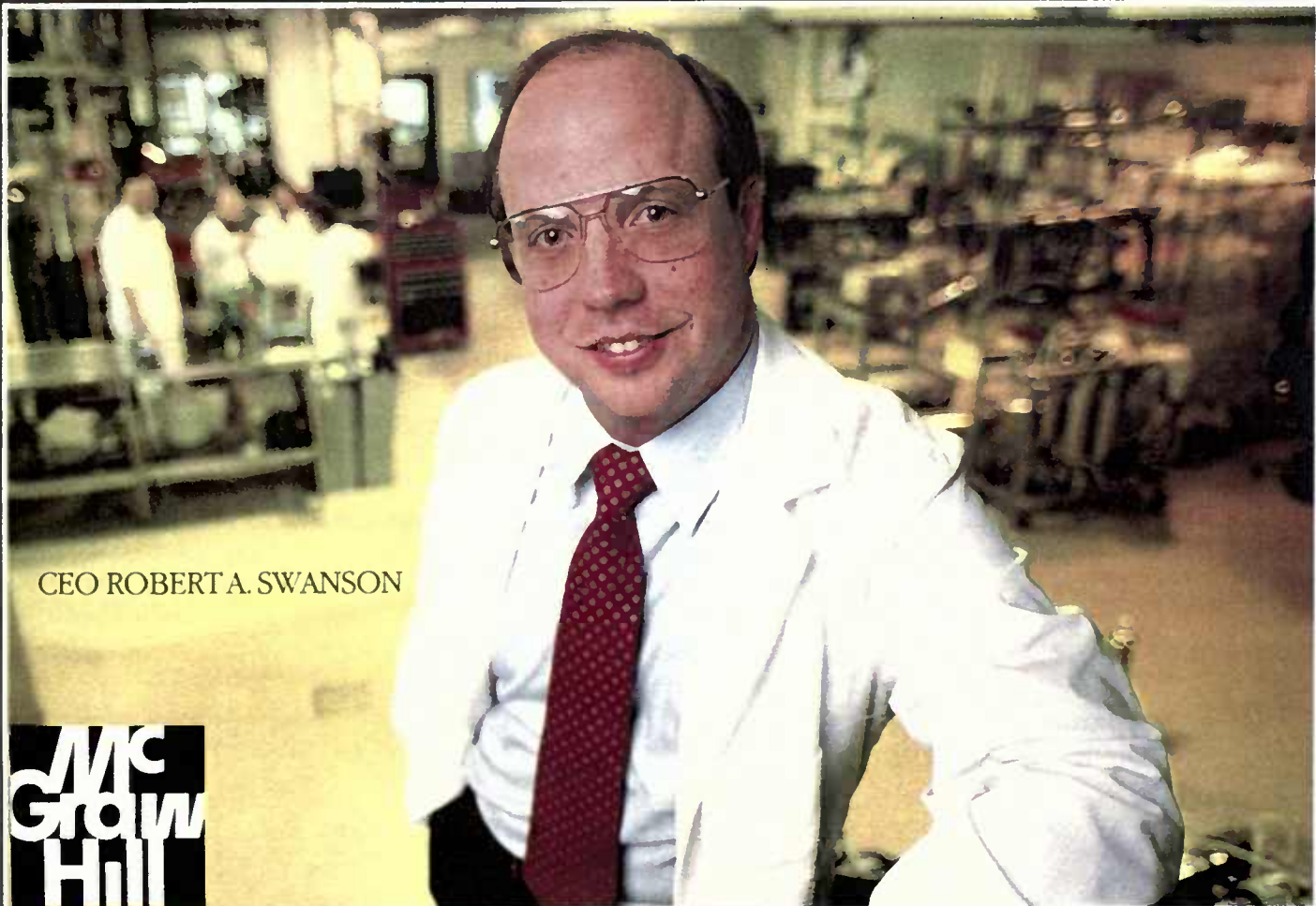
APRIL 14, 1986

A MCGRAW-HILL PUBLICATION

**BIOTECH
SUPERSTAR**

Wall Street loves Genentech. The reason: It's on the way to becoming a major pharmaceutical company

PAGE 68



CEO ROBERT A. SWANSON

**Mc
Graw
Hill**

Speech by
Robert A. Swanson, Chairman
Genentech, Inc.

At the Carolinas Chapter of the Association for Corporate Growth
Charlotte, N.C.
January 31, 1996

Thank you. It is a pleasure to be with you this evening. To discuss Venture Capital.

This year marks the 20th anniversary of the founding of Genentech. Those two decades have been years of extraordinary progress.

The most recent statistics available show that the biotech industry as a whole has sales income of about \$10 billion, an increase of nearly 800 per cent in 10 years. The industry now encompasses more than 1,300 companies with some 108,000 employees.

Twenty years ago, this industry did not exist.

As the figures for the biotech industry indicate, recombinant DNA technology is now an accepted part of medicine, agriculture, and other fields, but people sometimes forget that it was not always so. During the '70s the future of this technology was very much in doubt. I'd like to take just a few minutes to sketch the environment back then, because it is pertinent to the story of Genentech and its venture capital backers.

In 1973 Herbert W. Boyer, of the University of California at San Francisco, and Stanley N. Cohen, of Stanford University, demonstrated a method for replicating a foreign gene by inserting it into a micro-organism called *E. coli* - a technique that came to be called recombinant DNA, gene-splicing, or simply cloning.

Almost at once, some people, including some scientists, expressed concern about the potential hazards of this procedure. A novel, *The Andromeda Strain*, which was made into a hit movie, added to these fears. Things got so bad that the City Council of Cambridge, Massachusetts, where both Harvard University, and my alma mater, MIT, are located prohibited DNA experiments within the city limits. *The New York Times* denounced the technology in an editorial.

The entire U.S. scientific community decided on a moratorium for all experiments while the matter was studied. After three years, in 1976, guidelines were drawn up by the National Institute of Health to ensure that recombinant

DNA work would be conducted under the safest possible conditions. Those guidelines have been followed and there has never been a serious mishap involving recombinant DNA.

Let's go back one year to 1975. I was working with a venture capital firm called Kleiner & Perkins. I had been following the developments in this field and had read some impressive technical papers by Dr. Boyer and others. It seemed to me that this new technology was ripe for commercialization.

But as I talked with a number of scientists and businessmen no one was willing to agree with me. They all said it would be years - a decade or more - before commercial products would emerge. When I pressed them for reasons why, no one had any good answers.

By January of 1976, I was really impatient. Dr. Boyer was clearly at the forefront of the research -- and I decided to give him a call. It was what a salesman would term a "cold call." We'd never met before. He told me he was very busy -- he was friendly, but busy. I persisted and finally he agreed to give me 10 minutes of his time on a Friday afternoon.

Well, that 10 minutes extended into three hours. . . and at least as many beers. And I can't be sure in retrospect whether it was my persuasiveness, his enthusiasm, or the effect of the beers, but we agreed, that night, to establish a partnership to investigate the commercial feasibility of recombinant DNA technology.

There's always an element of luck in such things. And I was lucky. Just prior to my contact with Herb, he had collaborated on a research project from which the technology might be taken a further step -- to production of a useful product.

Less than three months later, in April 1976, Herb and I each put up \$500 and formed Genentech.

What we were proposing to do for the first time was take a human gene; splice it into the DNA of a common bacteria; and to do this in such a way that the bacteria accepted the DNA as its own, followed the instructions on the gene, and produced the desired protein.

Our first order of business at Genentech was to prove that it was possible and commercially feasible to get a bacteria to make a human protein. Nobody had done it before.

We started out cautiously. We rented everything -- office space, furniture, even a part-time secretary. We had no assets. There was just Herb and me -- and Herb also had obligations as a professor at the University of California at San Francisco. Kleiner & Perkins agreed to provide the first \$100,000 in venture capital funding, which lasted us nine months. As Tom Perkins would say later on, this was the first time their firm intentionally funded basic research.

We contracted with universities to do the early research. It was basic research that fit well into a university environment and is a good example of the valuable interaction between business and universities. The exclusive marketing rights we received have now generated royalty income to the universities of over \$160 million.

We knew that the road to success would not be easy, but there was one thing we did in those days which was easy. While discussing what to call the company, I suggested "HerBob." I can see by your reaction you agree with Herb. He also thought it was a terrible idea. In one of the flashes of brilliance for which he is famous, he immediately came up with Genentech . . . short for genetic engineering technology. It seemed like a terrific name, and the entire process took maybe 10 seconds.

One year after our founding, in 1977, Genentech was able to announce the successful bacterial production of the human brain hormone, somatostatin. This was a significant breakthrough -- the first useful product made by genetic engineering.

We were actually ahead of schedule. From start to finish, the research took just seven months. That caught many by surprise -- especially the venture capitalists who wanted an opportunity to invest more money at a low price.

In recognition of this accomplishment, Philip Handler, the president of the National Academy of Sciences, hailed the development as "a scientific triumph of the first order." And Stanford's Paul Berg, who would later become a Nobel Laureate, called it "astonishing."

Now that we had proven the technology, we felt comfortable investing in people and facilities. But finding the right people was difficult. At the time, most molecular biologists wouldn't even consider working for industry. They wanted professorships at universities.

Our first scientist was from Holland. As a post-doc, he had done much of the work in Herb Boyer's lab, and then returned home. Herb and I had to go to Holland and bring him back.

Of course, today it's considerably easier to hire scientists and other professionals. We get roughly 500 unsolicited resumes a month.

After our success with somatostatin, we next tackled the production of human insulin. Again one year later, in 1978, Genentech announced that microorganisms had been engineered to produce the product. Four years later, in the fall of 1982, human insulin became the first pharmaceutical product of recombinant DNA technology to receive marketing clearance from the FDA. Today Humulin, is marketed by Eli Lilly & Company under contract from Genentech, and is the product of choice for treating diabetes.

Our company was only six years old, and the first of its products was benefiting patients, years earlier than the skeptics had thought possible.

Today 10 of the biotech pharmaceutical products approved by the FDA are products of Genentech research. We manufacture and market 5 of those products and receive royalties on the other 5. Last year, total annual sales of products generated by Genentech research reached \$3 Billion.

At present we market, under our own name:

- Activase[®], tissue plasminogen activator used in treating heart attacks and potentially helpful in treating stroke as well;
- Protropin[®], and Nutropin[®], human growth hormones, for treating children who would otherwise be dwarfs;
- Pulmozyme[®], for the management of cystic fibrosis;
- Actimmune[®], gamma interferon, used to treat patients with chronic granulomatous disease.

I should point out that the four years that it took to get our first product to market might seem like a long time, compared with some other high-tech products, but in the pharmaceutical field, it's lightning speed. Because of this long lead time Genentech had to adopt some unique strategies.

Focused Strategy

Perhaps most important was our focused business approach.

Biotechnology offered such promising opportunities in so many fields that it was easy to be like a kid in the candy store -- doing a little of this and a little of that. But as Dave Packard reminded me in our board meetings, not many companies run into problems because of starvation. It's the indigestion that gets to them. We took his advice, and focused on doing a few things well -- first developing products in one area before expanding into another.

Genentech resources were channeled into health care products -- especially proteins with important therapeutic potential. These products were carefully chosen for their scientific feasibility . . . potentially large market size and high profit margins . . . opportunity for early market entry . . . and clear competitive edge.

However, even within pharmaceuticals, we had to decide which areas we WOULD be in, and which areas we would NOT be in. (For example, we chose not to be in the diagnostics business.) We focused on ethical drugs.

Within the ethical drugs category, we concentrated even further on products prescribed by medical specialists. Early on we felt we couldn't serve

well the more than 400,000 doctors practicing in the U.S. but specialist markets were within our reach. And because most specialists are based at the roughly 900 major hospitals nationwide, they could be reached efficiently. For example, a salesperson could visit a hospital, see an endocrinologist about human growth hormone, then walk upstairs to see a cardiologist about TPA, and go down the hall to see an internist about gamma interferon.

Only a small sales force was needed, and Genentech was not at a disadvantage competing with a pharmaceutical giant.

Financial Strategy

What about our financial strategy?

A little innovation in the financial area always helps. How else could we have managed profitability in the early years with R&D expenses running in the \$25-30 million range, and even before we were able to sell a single product to a doctor or his patients?

Seriously, entry into the ethical drug business takes substantial financial resources. Typically, a new pharmaceutical requires over \$150 million and 7 -10 years of research and human testing. How does a company eat while waiting for that ship to come in?

Genentech's strategy was to intentionally operate just over break-even during our necessarily lengthy product development period. Rather than use equity capital to fund our R&D, we financed our day-to-day operating expenses primarily with operating revenues from collaborative research, licensing fees, and product sales to our corporate partners for their clinical use. We endeavored to license our products in Europe and Japan while maintaining rights to market in the U.S.

We still required lots of cash. Since its founding, Genentech has raised over \$1.1 billion -- \$600 million from venture capital, private placements with corporate investors, from public offerings of stock and convertible debt, and from research and development limited partnerships. The last \$500 million came from our recent relationship with Hoffman LaRoche.

The agreement, with Roche, gives Roche a 60+% ownership of Genentech and the right to buy the rest at prices increasing to \$82 per share in 1999. It also provides for the independent operation of Genentech until such time as they buy 100%, if they do?

We established this unique relationship with Roche to have the financial stability that would allow us to make a long term commitment to research, which in today's world is often at odds with short term investment focus. Last year Genentech spent over \$360 million on research and development -- 40% of our total revenue and 3 times the industry average.

This investment has unleashed a new product pipeline that is the envy of the industry. In clinical trials marching toward approval we have:

Thrombopoietin - a platelet growth factor

IIB/III Antagonist - an anti clotting agent

Anti-IgE Antibody - for allergies and asthma

Nerve Growth Factor - for peripheral neuropathies

IGF-I - for treating diabetes

HER2 - for treating breast cancer

And there are more to come.

People Orientation

How does all this happen: It all comes down to people.

Investment in people is what has made the difference at Genentech. We work hard to make sure our employees enjoy coming to work every day and that they participate in the success of the company. It has paid off -- not only in terms of our business achievements but also in terms of employee moral.

Everyone in the company has an opportunity to own shares of Genentech's stock -- most of them are shareholders. It is our belief that those who are making things happen should share significantly as our business grows.

We've gone after the best folks we could find anywhere -- and have not been limited by geographic location. We've staffed lean and have maintained a tight focus on day-to-day operations. We've involved a broad-based mix of scientists and business people in our planning and decision-making. We've even hired 30 North Carolina graduates.

Genentech's research organization is among the largest in the world dedicated to recombinant DNA technology. With some 350 Ph.D.'s and M.D.'s, it is also one of the more entrepreneurial groups of people you are likely to come across. What about the management of such a crew? It's easy. We don't work on any projects we can't get someone excited about. (Sometimes it takes longer than others, but we never change that rule.)

I also feel it is important that once you've defined "stretch" business goals you allow a looseness in the organization that enables people to decide for themselves how best to achieve those goals. There also has to be enough freedom and time for people to follow their nose on new idea. And management needs to "walk around" and pay attention to what's really motivating employees.

In our business, publishing our research is important -- after we file appropriate patents. Genentech scientists publish about 250 papers each year (about one every business day). I know this is unusual for a company; but I believe we have more to gain from our interaction with the world's scientific community than we stand to lose by allowing this information to fall into the hands of our competition. Such interaction also is critical to attracting and keeping the very best scientific talent.

Two decades ago, Genentech began confounding the skeptics by turning out a procession of products. Today almost half of all biotech-based products on the market come from our labs.

All this happened because a scientist and a business man got together with a vision of what was possible and found a few people to back them. People like you in this audience tonight. Whether you are concerned with building your company from the inside or starting new businesses, it really all comes down to finding the right people that are driven by a dream. Give them a little money, a little guidance, protect them from the naysayers and the red tape, and get out of their way. Good things will happen.

Thank you.

Genentech's Chairman To Leave Firm

By Carl T. Hall
Chronicle Staff Writer

Investment banker Robert Swanson announced yesterday he is resigning as chairman at Genentech Inc., the pioneering biotechnology company he helped found 20 years ago.

In a news release, Swanson, 49, said he intends to step down from Genentech's board at the end of this month to concentrate on his "first love" — financing a new generation of "novel young companies working in uncharted areas."

He did not name any particular projects and declined interview requests.

Genentech plans to announce his successor today. Speculation yesterday centered on current members of Genentech's board, including Chief Executive Officer Arthur Levinson and two outside direc-



Robert
Swanson

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GENENTECH

From Page E1

tors — Franz B. Humer, chief operating officer and head of the pharmaceutical division at Roche Holding Ltd., the Switzerland-based drug maker that owns majority interest in Genentech; and J. Richard Munro, chairman of the executive committee of Time-Warner Inc.'s board.

The selection of Humer would suggest a stronger role for Roche in Genentech's day-to-day affairs, although both companies have insisted they intend to maintain Genentech's independence. Officials declined to comment yesterday.

Swanson said he intends to remain as a Genentech consultant. He also will continue as chairman at another biotech firm in South San Francisco, Tularik Inc.

As a 29-year-old investment banker, Swanson was among the first to recognize the commercial potential of genetic engineering, the technology that allows scientists to clone and manufacture rare proteins with medicinal and other uses.

He founded Genentech in 1976 along with Herbert Boyer, a biochemist at the University of California at San Francisco who played a key role in the industry's scientific development.

Boyer, though no longer active in Genentech's management, continues as a board member.

Swanson served as CEO from the company's inception until February 1990, but he continued as chairman.

Levinson paid homage to Swanson yesterday for shepherding Genentech into a major corporate presence in the Bay Area. The company now claims about \$1 billion in annual sales, has five drugs on the market and employs more than 3,000 people.

Roche now holds controlling interest in Genentech. The Swiss drug giant also has an option to acquire all remaining shares, with special provisions that effectively limit day-to-day price changes in the stock.

True to form, Genentech shares yesterday barely budged following the early-morning announcement of Swanson's resignation. The stock ended down 13 cents at \$53.25 on the New York Stock Exchange.

The Man Who Invented the Biotech Business

There is a poignant irony in the death last week of Robert Swanson, a co-founder of Genentech, from brain cancer at age 52. A quarter century ago he had a singular role in the formation of the biotech industry. Today with new medical treatments coming at a faster pace than any other time in human history, one of them will come too late to help him.

In January 1976, Swanson, then a 28-year-old venture capitalist, drove up from

Manager's Journal

By Frederick J. Dorey

Silicon Valley to the University of California at San Francisco. He had requested 10 minutes with Herbert Boyer, a biochemist and one of the inventors of recombinant DNA. The discussion adjourned to a local pub for several hours, and Genentech was born.

It is not too much to say that this meeting produced a new structure for science-driven business and fundamentally changed the relationship between business and America's research universities. Before Swanson made that trip, the best university research scientists would not consider joining industry, for their academic careers would be ruined if they did. Universities,

with their basic-research laboratories, and corporations, with their focus on product-driven development, passed like ships in the night. While universities published research papers, secrecy was the rule in industrial research. And research scientists who considered joining companies knew they would have to conform to a rigid corporate culture.

In the mid-1970s, a structure to help new companies commercialize technology was evolving in Silicon Valley. But the small community of venture-capital firms was focused entirely on electronics. At about the same time, and in the same region, Mr. Boyer at UCSF and Stanley Cohen at Stanford had succeeded in moving a gene from one organism to function successfully in a different kind of organism. Recombinant DNA was the province of a small group of academic scientists and the subject of a lively ethical debate, with no commercial interest whatever. A lone university administrator persuaded the scientists to file a patent application.

Swanson, with degrees in chemistry and management from the Massachusetts Institute of Technology, wondered whether new organisms could be created to help discover and produce pharmaceutical proteins. The answer seemed to be yes—given a lot of hard work, money and very good science. Swanson would have to start a company, hire the best research talent and win over skeptical investors. But this was the '70s, and gene splicing was not electronics. The most creative researchers had little interest in working for business, and there was no model for a start-up company based on biology. Research and product approvals would take years. Swanson would have to invent an entirely new kind of company.

Swanson became CEO of Genentech and set out to create an organization that the best scientists would want to join. The quality of their science was paramount; they could publish as much, and as often, as possible. Genentech developed its own products and retained the commercial rights. Unlike the pharmaceutical industry, Genentech protected those rights through patents, not secrecy. Swanson pioneered the use of research-and-develop-

ment partnerships to help fund the research. Through stock options the scientists would share in the success of their work.

Swanson had an unpretentious style that fit perfectly with free-wheeling scientists. He had no executive parking spot. Recruits who were impressed that the CEO had offered to drive them to lunch found themselves waiting at the company door while Swanson hiked to the far end of the parking lot to get his car. Genentech's Friday afternoon parties would have made a pharmaceutical executive blanch, but they delighted the employees.

Within a few years, Genentech had succeeded dramatically. A flood of new companies followed its path. Swanson's eye for talent produced a remarkable alumni group whose members now lead many of the next generation of biotech companies.

Investors and the public were transfixed. Fifteen years before the Internet frenzy began, Genentech's IPO in October 1980 was the most successful in history. The stock opened at \$35 a share and reached as high as \$88 on the first day of trading.

Swanson eventually stepped back from active management of the company. But he had one more dramatic example to set for the biotech industry. Pharmaceutical product development takes enormous resources and years of effort. Ultimately it is beyond the sole resources of even the most successful biotech company. In 1990 Genentech stunned the industry by announcing that Roche pharmaceuticals would buy a controlling interest for \$2.1 billion; some called it a sellout. Employees worried that Genentech's distinctive culture would disappear. But it needed the capital to fund development, and Genentech continues today as a remarkable source of scientific innovation.

Swanson stayed on as chairman until he resigned from the Genentech board in 1996. He worked with his own venture capital fund and served as a director of a number of private companies. He stayed out of the limelight, turning down most



David Smith

Robert Swanson
Founded Genentech

speaking invitations. He was diagnosed with a brain tumor last year but continued to be active in business until last summer. He is survived by his wife and two daughters.

In the quadrangle of the new research complex at Genentech, there is a life-size metal sculpture of two men sitting at a table, each with a beer. One is Bob Swanson dressed in a suit. He is leaning forward enthusiastically making his point. The other is Herb Boyer, the counterculture university scientist in denim vest and bell-bottom jeans. He is leaning back, skeptical but intrigued. He is on the verge of deciding to cast his fate with the young venture capitalist. It is a fitting memorial to the moment of the founding of Genentech, the biotech industry and a new approach to the business of science.

Mr. Dorey, a lawyer in Palo Alto, Calif., is former president of the Bay Area Bioscience Center.

Obituary

Robert A. Swanson (1947–99)

On 6 December, the founder of Genentech, Robert Swanson, succumbed to brain cancer. He was only 52, and with his death the world has lost one of its visionaries — a man who is widely considered to be the father of the biotechnology industry, and who a year ago was included as one of the few living people on a list of the millennium's most influential individuals.

Swanson grew up in Florida and was educated at the Massachusetts Institute of Technology, obtaining degrees in chemistry and business in 1970. He started his professional career as a venture capitalist with Citicorp in New York, then in 1973 moved west to San Francisco and began a lifelong fascination with molecular biology. He was in the right place at the right time, as the pioneering gene-cloning experiments of Herbert Boyer, Stanley Cohen and colleagues were being carried out only minutes from his office.

In 1976, he arranged a fateful meeting with Boyer — a meeting now commemorated by a life-sized statue of the two men in the Genentech research complex (Swanson's is shown in the picture here). After several hours and a few beers, they agreed to team up to create Genentech, the world's first biotechnology company. The upshot was an industry that is now worth more than \$100 billion and is responsible for around 80 approved drugs that benefit millions of people.

Although Boyer laid the scientific foundation for the company and set its early research direction, he remained at the University of California, San Francisco (UCSF). So it was the 28-year-old Swanson who ran Genentech. Initially, this meant raising enough money to fund proof-of-principle projects at UCSF and the City of Hope Medical Center. In 1977 these groups demonstrated that bacteria could be coaxed into making the human protein somatostatin. Swanson then set his sights on human insulin, a previously unavailable pharmaceutical, and rented space in a warehouse to build Genentech's labs.

This transition, from a 'paper' corporation that supported research in academic labs to a real company, was a critical juncture for Genentech. Swanson now had to convince young postdocs to forgo the standard academic career path and to join his quest to create medicines through the power of a new technology. He succeeded because he was able to generate his own conviction and excitement in others, as we know only too well — we



Venture capitalist and the Pied Piper of biotechnology

were two of his earliest recruits. Remember that at the time genetic technology had limited funding, and even leading molecular biologists thought it was neither commercially nor intellectually viable.

Swanson was a businessman, but he never gave up hope in the science or the scientists during the early days. It was Swanson who was smart enough to hire the best people and give them an environment that allowed them to make a difference. Swanson also reminded us why we were doing it — for the patients — and he challenged employees with the ultimate personal motivation, "Would you put this drug into your own child's body?"

And it was Swanson who made all that hard work a lot of fun. He led the celebration as each milestone passed, including the early successes with drugs such as insulin, growth hormone, interferon and factor VIII to name a few. In 1987, when the US Food and Drug Administration approved Activase (tissue plasminogen activator) for the treatment of heart attacks, the festivities included, with permission from nearby San Francisco International Airport, a huge firework display that caused a temporary disruption of air traffic.

Swanson and Boyer started a company, but they also nurtured a unique culture at Genentech — one that departed radically from the standard in the pharmaceutical industry. First, there was very little hierarchy, a structure that encouraged employees to take risks and that paid huge dividends in scientific thinking and productivity. Second, there was the need to

attract the best postdocs and scientists from academia.

Twenty years ago it was considered heresy for top academic scientists to join industry. Swanson and Boyer attacked the reluctance at its source, which was the inability of pharmaceutical companies to see the connection between basic research and ultimate commercial profitability. Boyer had made it clear that, to recruit top scientific talent, Genentech would have to allow them to publish their discoveries, and promptly. This policy gave Genentech a recruiting advantage and forced many other companies to establish a similar approach. Part of Swanson's legacy is the number of seminal

publications in biology produced by scientists employed by industry.

Genentech was again an innovator in 1980 when it became the first biotech company to sell stock to the public. This was quite an education, for many of us had no idea what it meant to 'go public'. Employees were told that the stock might be floated at \$20 per share. The deal was finally priced at \$35 per share and the first shares traded at \$88. Swanson and Genentech had created business history long before the word 'Internet' had become common currency. Furthermore, we molecular biologists now understood that it was possible not only to create life-saving drugs, but also to be well compensated for our work. We felt we had the best jobs in the world.

Swanson was chief executive officer of Genentech until 1990, then served as chairman until his retirement in 1996. That year he joined the board of Tularik, a private biotech company specializing in gene regulation, as chairman. He also returned to his roots by starting his own venture-capital firm, and continued to enjoy helping young scientists and businessmen turn their ideas into start-up companies. However, Bob's family remained his top priority. He is survived by his wife, Judy, and daughters Katie, 16, and Erica, 11.

Bob Swanson was dedicated to generating drugs that would save lives. In following that aim, he also made people believe, like him, that the seemingly impossible was indeed possible. It is that spirit which will live on.

David V. Goeddel and Arthur D. Levinson

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U.S. PRIZES**17 Get Science,
Technology Medals**

Researchers who plumbed the depths of the Antarctic ozone hole, helped show that modern cells are assembled from once-independent life-forms, and created reading machines for the blind were among those awarded National Medals of Science and Technology this week by President Bill Clinton. They will be honored at a 14 March ceremony.

A dozen investigators won the coveted National Medal of Science, which Congress created in 1959, while four investigators and one company gained the prestigious National Medal of Technology, created in 1980. Cellular biologist Lynn Margulis of the University of Massachusetts, Amherst, one of two women honored, helped win acceptance for the once-controversial idea that plant and animal cells are the product of partnerships between ancient, bacterial-like organisms. Atmospheric researcher Susan Solomon of the National Oceanic and Atmospheric Administration, an unusually young medalist at 44, was honored for her studies of the South Polar ozone hole. Raymond Kurzweil, founder of Kurzweil Technologies, was recognized for his pioneering work on voice recognition, which has produced many modern aids for the visually impaired.

The other science winners, by field, are: Biology—David Baltimore, California Institute of Technology; and Jared Diamond, University of California, Los Angeles. Chemistry—Stuart A. Rice, The University of Chicago (UC); and John Ross, Stanford University. Economics—Robert M. Solow, Massachusetts Institute of Technology (MIT). Engineering—Kenneth N. Stevens, MIT. Mathematics—Felix E. Browder, Rutgers University; and Ronald R. Coifman, Yale University. Physical Sciences—James W. Cronin and Leo P. Kadanoff, UC.

Other National Medal of Technology winners are: computing innovator Glen Culler, Culler Scientific Systems; biotech industry pioneer Robert Swanson (deceased); ARPAnet founding father Robert Taylor (retired); and Symbol Technologies Inc., for development of laser bar code scanning and wireless local area network technologies.

—DAVID MALAKOFF

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