From a Good Base to a Better Place

The Decade-Long Effort to Build a Premier School of Engineering, The Jacobs School at the University of California, San Diego

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December 2023

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Recent Writings

Robert W. Conn, "**Why Philanthropy is America's Unique Research Advantage**", presented at the National Academy of Sciences, Feb. 2020. See ISSUES in Science and Technology, Aug. 21, 2021. https://issues.org/philanthropy- science-technology-unique-research-advantage-conn/ . See also, The Next 75 Years of Science Policy, Special Collection of Papers. ISSUES in Science and Technology. National Academies of Science, Engineering and Medicine (NASEM) 2022. Pp.336-344.

Robert W. Conn, Peter F. Cowhey, Joshua S. Graff Zivin & Christopher L. Martin**, "Science, Philanthropy, and American Leadership",** National Bureau of Economic Research, Working Paper 31718, September 2023. At https://www.nber.org/papers/w31718 and https://ucigcc.org/publication/report/stem-philanthropy-and-the-american-innovation-ecosystem/

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Prologue

To borrow from Jim Collins, this is a story of “good to great” and of how, in the setting of higher education, one approaches building from a good base to a better place. There are the elements of vision, strategy, tactics, and “seize the day” opportunities. There are the challenges of managing such an effort within a large and complex environment where many forces, interests, and personalities are at play. In this particular story of the Jacobs School of Engineering at the University of California, San Diego, all these elements are illustrated and illuminated.

Academic institutions are different from profit making businesses in the nature of the motivations and workforce cultures, particularly the nature of the faculty, the central employees of any academic enterprise. It is for this reason that some elements in this story are different from those described by Jim Collins in his famous book of 2001, Good to Great. (https://www.amazon.com/Good-Great-Some-Companies-Others/dp/0066620996)

This is also my personal story of coming to UC San Diego in January of 1994 to begin my tenure as the first dean of its new School of Engineering (formally a Division) and building it into a premier School by 2003. (The rankings in 2003, as just one metric, justify the use of words such as “premier” and “great”.)

The circumstances of my coming were somewhat surprising, as it was Tom Dillon, a Vice President at the defense company Science Applications International Corp. (SAIC), who first approached me. That was in September of 1992, and the approach was to ask if I’d consider moving from UCLA to UC San Diego. Tom and I knew one another - we were both involved with the country’s program to develop fusion energy - but Tom had not discussed this idea with anyone at UC San Diego, and particularly not with the campus’s chancellor.

Tom took the initiative betting on the come. His interest stemmed from my standing in the field of fusion energy engineering, a field that I, with my colleague and partner Jerry Kulcinski, created in the 1970’s while at the University of Wisconsin-Madison. I would say “no” to Tom, but offered a suggestion that might turn “no” to “yes”. Tom listened carefully and the rest of the story follows.

Chapter I

An Unexpected Meeting

Background

In 1985, Chairman Gorbachev and President Reagan agreed at their Summit in Reykjavík to proceed jointly to develop a fusion energy demonstration reactor. They named it ITER, Latin for journey. Thus began a long-term international program to design and build ITER that continues today. The initial program partners were the United States, the European Union (EU), Japan, and the Soviet Union (USSR). In the late 1980's, the ITER project established a Technical Advisory Committee (TAC) to which each partner appointed one representative. I was the US representative.

Around 1990, the ITER program put out a call-for-proposals to the four partners for a headquarters to house the ITER design team. In turn, the US Department of Energy (DOE) put out a call-for-proposals to find a US location so as to propose it as the new headquarters for ITER. SAIC, partnering with UC San Diego, responded to the call from DOE, won the US competition, and subsequently the international competition. Tom Dillon, as VP at SAIC, led the proposal with his team, and UC San Diego was his partner.

Once awarded the contract, Tom and his team rented space on the Torrey Pines mesa, just north of the UC San Diego campus, to be the headquarters of the international ITER design team. At that point, Paul Rebut of France had been named Executive Director of ITER and he gathered people from the various partners around the globe to form his design team. With this, the ITER international design team made its headquarters in La Jolla, again just north of the UC San Diego campus.

An Unexpected Meeting at UCLA in September 1992

All this is prelude to why Tom Dillon asked to meet with me at UCLA in September of 1992. Tom had a request: Would I consider moving my large fusion energy experimental and reactor design research program from UCLA to UC San Diego? He said that UC San Diego had no strength or program in fusion energy, though it did have a strong basic plasma physics program centered in its Physics Department. He felt that a strong fusion energy and engineering program at UC San Diego would be both good for the university and strengthen the entire enterprise in La Jolla. SAIC had been part of fusion reactor design and engineering programs that I had led with my UCLA team.

I said “No” and explained that I had moved a large program from the University of Wisconsin to UCLA in 1980 and had no interest in repeating myself. A bit shocked by the blunt reply, he then asked if I would at least agree to meet Richard Atkinson (Dick to his friends and acquaintances), the UC San Diego chancellor. While I was hesitant and not actively seeking to leave UCLA, I felt it wrong not to at least meet the chancellor of another major UC campus. And I did say to Tom that I was aware UC San Diego had a search on-going for a new dean of engineering. If the Chancellor might think this appropriate, perhaps I would have greater interest.

On the other hand, and perhaps with some arrogance, I said to Tom that I had international travel upcoming and other commitments through October, but maybe we could find a day in November. We left with a handshake.

Tom told me later that upon his return, he did speak with Dick Atkinson about our meeting, and mentioned my interest in the deanship, to which the chancellor apparently replied – “Why would he be interested in that?” Truth was that I was ready for a new challenge, UC San Diego was a place I admired, and while engineering there was not highly ranked at the time, in fact it had a strong cadre of faculty.

Two Meetings with the UC San Diego Chancellor Richard Atkinson

Sometime in October 1992, Tom called me and offered dates in November, and we settled on a one for Dick Atkinson and me to have dinner. I don’t recall the location, but we covered a lot of ground. Dick had many questions, I did too, yet towards the end of the dinner, I said to Dick that while I’d appreciated his meeting with me, my answer was still “no”.

And then Dick said something he hadn’t yet brought up that evening. He asked me “What if I could make you the Dean of Engineering along with changing the name from a Division to a School? What if I could help provide the resources to grow and make it great?" I had thought about this, as I mentioned earlier, but once he explicitly asked about my interest, I could feel the excitement rise inside – I could smell it. This might be an opportunity to build a great engineering enterprise. That was what Dick was offering.

He had a vision, and so did I. He told me his view of why Stanford, where he'd been a faculty member for a long time, was now great. It was truly great in science, engineering, business, and law. Those were the pillars he wanted at UC San Diego. He knew he had it in science, he wanted it in engineering, and he knew he didn't have it.

And so I said, "Let's meet again to flesh out the details". I needed to know that I would not only have his support but that I'd have the resources needed to move ahead. It was also key that the Vice Chancellor for Academic Affairs, Marjorie Caserio at the time, was on board.

As I looked carefully at the faculty across the Division of Engineering, I discovered a hidden feature – some of the faculty were amongst the best in the world – Sol Penner, Bert Fung, Shu Chien, Forman Williams, Frieder Seible, Gil Hegemeir, Peter Asbeck, Bill Chang, Larry Milstein, Christos Papadimitriou – strength across the spectrum. In addition, of the approximately ninety faculty, eight were members of the National Academy of Engineering (NAE). Bert Fung was actually in all three branches of the Academy – science, engineering, and medicine – and Shu Chien was in two branches, engineering and medicine. (Shu would later be elected to the science branch, managing a trifecta.) If I were to come to UC San Diego, the number of academy members would rise from eight to nine, or 10% of the faculty at the time. This compared to four NAE members out of one hundred and twenty-five faculty at UCLA in 1993.

On the other hand, UCLA was ranked 14 amongst the best graduate schools in engineering in 1993 by US News and World Reports. By contrast, UC San Diego was ranked 44! Quite the difference. Yet I read this as meaning that while the "bones were better" at UC San Diego, for organizational and historical reasons that I understood, the recognition was poorer. UC San Diego did not have traditional names for its departments, and many area disciplines were buried in a single superstructure department. So I knew that the foundations were strong and that by becoming a School of Engineering, very good things could happen. But that would take leadership, persistence, and patience.

Dick Atkinson and I met a second time in late November or early December of 1992, now in his office, to discuss specifics. I would have resources, financial and otherwise, and he put a piece of paper with a seven-figure number on it into his top desk draw. He said that if I came, that would be available to me. He also said that I could appoint an Associate Dean, which would be a first on the UC San Diego campus.

"But", he said, "I'll need to do a national search. I'll do it quickly, putting out ads first thing in January (of 1993), and close the search a month later." I would need to apply, and I did. By late Spring of 1993, and after what I felt had been a strong interview and campus visit, I had an offer in hand.

I was excited but there was a problem. The salary was somewhat lower than my current academic year and summer salary combined, and I would have to give up my consulting, most of which was in the Los Angeles area. Here's where Tom Dillon stepped in once again. I called Tom to explain that I really wanted to come but the salary offer was not what I expected. He said he'd get back to me. He called a few days later and offered me a consulting agreement with SAIC <u>and</u> he offered stock options. Well, that was something, and it sealed the deal.

I accepted the offer in June of 1993, informed Chancellor Chuck Young and engineering Dean Frank Wazzan at UCLA of my decision, and began planning my transition, both professionally and personally .

Chapter II

Transition and Arrival

I needed to remain at UCLA for fall quarter 1992 to organize my personal move, speak with my staff and students, and organize the move of my research program. My program in fusion engineering, plasma physics, and plasma-surface interactions received about $5 million a year from the Department of Energy (DOE). I had a staff of permanent senior researchers, post docs, and graduate students, about 30 in total. And I had to work with the program staff at the Department of Energy (DOE) responsible for my research grants. This worked out smoothly – the DOE wanted the research program and were less concerned about where it was located.

The other aim was to induce most of the research staff and post docs to move with me, which they did, and to work out the best arrangement for my UCLA graduate students. This I did too. Most of my staff and post docs moved with me, while most of the more senior grad students moved to UC San Diego while remaining UCLA students and received their PhD degrees from UCLA.

During that fall of 1993, I made four or five visits to the campus, meeting with faculty and department chairs, all with the aim of absorbing the place, assessing its strengths and weaknesses, and considering opportunities. Overall, I did have in my head a strategic plan in outline form and needed information to have this strategy emerge with real structure and force.

Dick Atkinson is nothing if not a man of his word. The Division of Engineering became a School of Engineering on the day I began, Jan. 1, 1994. David Miller, whom I had met in the summer of 1993 at Dick's suggestion, became my Associate Dean, and with that, the journey began. It is a story of engineering at UC San Diego from 1994 to 2003 and its rise from good to great. In this period, the Division became a School of Engineering, then the Irwin and Joan Jacobs School of Engineering, until finally, over nine years, it grew both in national prestige and in the rankings, moving from 44 in 1993 to 11 in 2003. By the time I left in mid-2002, we had arrived full blown.

This, I say immodestly, is the fastest rise in rankings of any school or college of engineering in history. Twenty-five years later, the School is still ranked in the top

15, has been as ranked as high as 9, and in 2023 is ranked 12. In this rarefied air, Schools move about a bit in rankings, but few fall out of the top 10-15. The Jacobs School by all measures is today one of the premier Schools of Engineering in the United States.

Chapter III

A Brief History of Engineering at UC San Diego – 1964-1993

In 1964, engineering at UC San Diego began disguised as "Applied Science and Engineering Physics" with the formation of two broadly named departments: the Department of Aerospace and Mechanical Engineering Science, or AMES; and the Department of Applied Electrophysics, or DAEP. For those who know the history, just jump ahead to section IV.

The Department of Aerospace and Mechanical Engineering Sciences (AMES) and its Evolution

Sol Penner, the founder and first chair of one of the two original departments, the Department of Aerospace and Mechanical Engineering Science (AMES), has written a wonderful and informative history of AMES from its inception in 1964 through to the time of my arrival in 1994. Sol has written a wonderful history of AMES/MAE through 2015, see:
https://mae.ucsd.edu/about/history#:~:text=At%20UCSD%2C%20AMES%2C%20under%20the,a%20new%20field%20of%20Bioengineering

Eight years after its founding, the department changed its name to Applied Mechanics and Engineering Science, still with the acronym, AMES, and still focused on the engineering sciences.

My own faculty position was in fact in the AMES department, and my Ph.D. from Caltech in 1968 was in engineering science. In the mid 1960's, the fashion was that the foundations of engineering were really in the applied sciences and mathematics – real engineering would be picked up later. This proved to be a passing phase in engineering education but at UC San Diego, it persisted into the 1990's.

Sol Penner was recruited from Caltech to build the AMES department and he was himself already a renowned scientist and engineer. He was a major figure in combustion science and rocket engines. and was elected to the National Academy of Engineering in 1977 for his achievements.

In his history, Sol covers the first change that took place during my tenure, namely, the spinning out from AMES of the Department of Bioengineering in 1994. He also describes the second change, spinning out the Department of Structural Engineering in 1999. With this latter event, AMES finally changed its name to the Department of Mechanical and Aerospace Engineering.

These two changes concluded the realignment of the departments during my tenure and was part of my plan to ensure recognition of each department's strengths. Each department would now have a straightforward and recognizable names allowing outsiders to assess their strengths more easily. This made a large differences in the rankings of the departments, and despite concerns on the part of some, rankings matter. You just can't get away from it, it's as simple as that. Of course, there is much more than just recognizable names when it comes to outsiders evaluating quality, impact, and recognition of programs, but the most important factor is the quality of the faculty. I'll return to this key point.

The Department of Applied Electrophysics (DAEP) and its Evolution

There other original department was the Department of Applied Electrophysics, or DAEP. A history is provided by the current ECE department and can be found at https://www.ece.ucsd.edu/about/history .

Briefly, and in parallel with Sol Penner's efforts with AMES, the ionospheric radio scientist Henry G. Booker was recruited from Cornell, appointed Chair of the Department of Applied Electrophysics, and asked to build a high-quality faculty. Booker, like Penner, was renowned and he was already a member of the National Academy of Sciences. His charge, like Penner's, was to build a strong department, and he did. In both cases, building a strong department meant recruiting extraordinary faculty.

Looking back over time, perhaps Bookers most important recruit was Irwin Jacobs, then a relatively young but outstanding MIT professor. Booker had known Jacobs as an undergraduate at Cornell, had had him in a class, and had followed his development. This recruitment more than any other would impact not only engineering at UC San Diego but the entire San Diego region, its economy, and its cultural standing.

Over a period of three years, Booker did hire thirteen professors to constitute the inaugural faculty. Among those faculty, as mentioned, was Irwin Jacobs, who looms large in the 1990's in this story. Amongst the other people he brought to the department were ionospheric physicists Jules Fejer, Hannes Alfven (who won the Nobel Prize in Physics in 1970), Ian Axford, Kenneth Bowles, and Peter Banks. Together, this group accounted for 90% of the "most influential" papers relating to the ionosphere in the late 1960's. Kenneth Bowles soon became the director of the campus's first Computer Center, which in the 1970's developed the computer language, UCSD Pascal.

In 1968, the department was renamed the Department of Applied Physics and Information Science (APIS) to recognize the importance of computer science and engineering. APIS in the 1970's broadened to include electronics, computer science, information and communication theory, signal processing, electronic devices (semiconductors), and materials.

In 1978, the Department again changed its name, now to the much more recognizable Department of Electrical Engineering and Computer Science, still a hybrid of EE and CS. The department continued to build in strength until finally, given its now large size, it split again in 1987 for a final time. Two departments emerged: the Department of Electrical and Computer Engineering (ECE); and the Department of Computer Science and Engineering (CSE). This is the structure in place when I arrived in 1994, and it remains in place to this day. I had in mind creating a separate Computer Engineering Department and adding information sciences to the CS name, but my tenure of nine years did not permit this change to occur.

Chapter IV

The Philosophy and Strategy Behind Building a Great School

The Faculty

The first element of any strategy relating to leading a university or school is to recognize that the quality of the faculty is everything. That's a bold statement, but it has always been my view that at a research university (or a college or school within such a university), it is the quality of the faculty that creates the reputation, which in turn attracts wonderful students and ensures sustained greatness over time. Everything follows from a faculty of extraordinary people.

I use the word "greatness" in this essay, and what I mean by it is that the school, college, or university is widely respected nationally and internationally for the high quality of its departments and programs. There are many efforts to "measure" greatness and the old adage "You know it when you see it" does apply. In every day terms, what it means to "see it" is that, in any conversation about the school or university, it is always a respectful one, one where it is clear that the place is held in high regard, and perhaps seen with some envy as well.

Rankings are but one metric here, and they do, like it or not, influence how a school is viewed. While those who complain that we should not "manage to the rankings" are correct, ignoring the rankings is likewise an error. So when I use greatness and great as a characterization of a school or university, the explanation in this paragraph is what I mean.

With respect to faculty and their standing, it is crucial that leadership show and express a deep respect for the variety of research styles that characterize any faculty. What must be crystal clear is that what is important is the quality, the impact, and the recognition of the work a faculty member does. That means leadership must make it very clear that it understands that faculty and their students can do great work within small, medium, or large groups. And the leadership must make it equally clear that though the financial support for a research group can range from modest to very large, a faculty member's funding does not matter when assessing advancement. The metric for evaluating faculty is worth repeating - it is the quality, impact, and recognition of their work - not the style or financial scale of a faculty member's research enterprise.

This principle of advancement and reward of faculty based on the quality, impact, and recognition of their work creates a culture that ensures faculty of all stripes feel respected and included, and this in general means they will get behind the effort to build and sustain the enterprise.

The culture becomes one of ensuring that the motivation of a faculty member is to produce distinguishing work, work driven by his or her own curiosity, and their own taste in problem selection. These choices by faculty members does not depend on the scale of research funding needed to succeed. This overall approach motivates everyone, creates a culture of respect, drives high quality work, lays out clearly what success looks like, and leads to the recognition of high quality by outside observers – faculty, deans, and presidents elsewhere.

The Students

Students at the undergraduate level seek a strong education and a vital environment in which to study. This vitality is in large part created by the discovery research going on at the university in their area of study. They will be taught by outstanding faculty and during their undergraduate careers have the opportunity to work with faculty and their groups, becoming exposed to the latest ideas and discoveries. That is exciting.

At the graduate level, the best undergraduates from any other colleges and universities will want to come to work with faculty of outstanding reputation in their fields. This attracts the best graduate students, and they in turn become part of strong research groups, and it all becomes a virtuous cycle – great faculty attract great students, all do strong work, and excellence comes again and again with respect to discovery research.

At the undergraduate and graduate levels, financial support for students is often essential to attract a diverse cadre of excellent students. Scholarships at the undergraduate level and fellowships at the graduate level are key tools in attracting and retaining the very best students in the programs of the school or university.

Focus, Focus

At a research university, it is important to excel in at least three or four major areas that constitute any field, especially given that in general one cannot be the best in every area of a general field. What matters is to be the best in the areas of your choosing, and that those chosen fields are of great importance within the field as a whole. The essential strategy that follows from this principle is that, in building a department within a school or university, one must choose focus areas within disciplines, and work to ensure that the faculty in those areas are extraordinary. This guides hiring and the deployment of the “coin of the realm” in a university, open faculty positions.

In the building of a school, or in the transformation of an already large school, college, or university from a good base to a better place, the strategy of focus areas of great strength leads in my view to the idea of “cluster hiring”, that is, to hire often at least three to five new faculty members in any given focus areas.

The size of a cluster depends on existing strengths. Sometimes, as few as three new people can make all the difference, but most often, the number is five to seven. The key is to ensure that whatever the total number is, the senior hires are people of high repute while the more junior faculty are people of high potential. This ensures that the message to those elsewhere is - Wow, look what just happened at UC San Diego! I’ve called this the “Wow” factor.

Seize the Day!

Sometimes, opportunities are obvious, such as in 1994 when I started as dean. At the time, there were revolutions underway – the internet and wireless communications. And there was a third emerging area, bioengineering. Sometimes, opportunities are driven by a surprise, such as by an outside funder, often a philanthropist or foundation, whose interests align with the needs of a focus field. One can work with such a funder to drive quality, growth, and infrastructure. The old adage that “luck favors the prepared mind” is very appropriate here. If you’ve thought about where you are going, and have a strategy, it is much easier to recognize an opportunity and seize it. Seizing the day amounts to optimizing the approach and pathway to success.

Resources Matter, and Financial Resources Matter Too

Most academics will tell you that faculty positions, sometimes called Full Time Equivalents, or FTEs, are everything. They'd be right. I'd add that it is easier to maintain greatness than to create greatness. By this I mean it is more important to have growth in faculty as you go from good to great than to have many new faculty openings once you are great, and at steady state. The contrast in 1993, the year before I came to UC San Diego, was clear between Stanford, UC Berkeley, MIT, and UC San Diego. Engineering at each of these premier schools included a large cadre of faculty (greater than 200 and up to 300) who were recognized as great, and each was very highly ranked.

UC San Diego was good, but a few hires here and there would not change anything. UC San Diego's ranking in 1993 in engineering in US News and World Reports was 44. By contrast, MIT was 1, Stanford 2, and UC Berkeley 3. What was needed was faculty growth, high quality hiring, and cluster hiring. And despite some viscousness within the central campus, we did grow at UC San Diego, and we did prosper.

Faculty positions is one requirement. The other is to have, or to raise, the financial resources needed for such crucial things as startup funds for new faculty hires, for retention of faculty being courted by others, and to have resources to support new opportunities as they arise. It is likewise key, especially during growth, to raise the funds needed for the buildings and facilities required to house a growing enterprise. At UC San Diego, this took the form of working with philanthropists and foundations, commitments from the general campus for infrastructure needs, and during my tenure, two historic special commitments from the State of California.

The Endowment and the Key Role of Donors

What an engineer would call "free energy", a term borrowed from thermodynamics, is central for a School or university if it is to have the flexibility required to seize opportunities and sustain greatness thereafter. An endowment is the most effective way of creating this free energy. By endowment, I mean a large corpus of funds (greater than $50 million) raised primarily from philanthropists. The “best” funds are those with few or no restrictions on the use of the annual payout earned by the endowment fund.

Typically, an endowment is invested to create on average annual return equal to about 5% plus the annual cost of living increase. This by the way is not an easy investment objective. As a simple illustration, an endowment of $100M would need to earn 8% if the inflation rate is 3% and the annual payout rate is 5%. For a School of Engineering, having $5 million each year available as unrestricted funding and opportunistic use is an enormous advantage in moving the enterprise smartly forward.

Overall, an endowment is an enterprise’s unfair advantage. And most schools of engineering have at best a modest endowment. At private universities, where the endowment is often larger than at public universities, the endowment is often dominated by funds for endowed chair professorships, where the payout annually underwrites most or all of the faculty member’s salary. That leaves little flexibility at the departmental or school level.

Donors, whether individuals, foundations, or industry, contribute to many needs of a university. At private universities, endowed chairs for distinguished faculty are crucial to the institution’s financial viability, coving the annual cost of a faculty member’s salary. At a public university, the academic year salary of a faculty member is generally covered by state funds. But endowed chairs are a key to recruitment and retention of faculty, and in the story of the Jacobs School, a good 50% of the endowed chaired professorships were funded by industry or industry leaders.

Support for scholarships and fellowships are key to attracting a high quality, diverse cadre of undergraduate and graduate students. (By diversity, I mean diversity of communities from which students come, both economically and geographically, diversity of cultural backgrounds, and diversity of geography, including international students.)

Finally, private support to enable a university to build new infrastructure such as buildings and laboratories is central, even at a public university where many buildings a built with state funds. In the story of the Jacobs School’s rise to prominence, you will see all these features.

Service and Local and National Engagement

The three major components of a faculty member's work are teaching, research, and service. The first two are self-explanatory. Service ranges from service on campus committees to helping with the needs of the surrounding community to advisory service on state or national committees with regards to policies about higher education and research. Faculty might even, from time to time, take leave of absence to serve in state government or at the federal level.

Service itself has its own intrinsic value, but it is also important to a campus's visibility and reputation. When present in policy matters on the national scene, such service raises the visibility of any campus. Just think of the universities that come to mind when one thinks of academics coming to Washington to work or advise the federal government. Perhaps the quintessential example would be Harvard and the number of Harvard faculty who came to Washington to serve in the 1960's and 1970's in the administrations of Presidents Kennedy, Johnson, Nixon and Ford. They range from McGeorge Bundy to Henry Kissinger. Such service first became prominent during World War II when, as examples, Vannevar Bush, the former Dean of Engineering at MIT, became President Roosevelt's science advisor and Robert Oppenheimer of UC Berkeley became the leader of the effort at Los Alamos to develop and build the atomic bomb.

During my tenure, we encouraged service at the state and national levels. I myself served as chairperson of the Department of Energy's Fusion Energy Advisory Committee (FEAC), and faculty such as Frieder Seible served on state boards setting standards for the design and construction of earthquake resistant infrastructure range from buildings and bridges to freeway overpasses. Other faculty did stints on assignment at the DOE and at the Defense Advanced Research Projects Agency (DARPA).

The School and its faculty also contributed to the San Diego region. The most prominent example was helping Larry Rosenstock in the years 1998-1999 design the curriculum for High-Tech-High School (HTH), a unique public charter school. The vision for HTH came from a group organized by Gary Jacobs, who persuaded Rosenstock to leave his position as head of the Sol Price Charities to help create, lead, and launch HTH. The goal was to serve the full diversity of the San Diego region.

From a single high school on the converted Marine base downtown, this HTH enterprise today operates sixteen schools in the greater San Diego area: six high schools; five elementary schools; and five middle schools. The School of Engineering played a small but important role in its curriculum development that persists to this day. This story is told in chapter XIII.

Chapter V

Building the Base and Driving the Journey Forward

My approach from the earliest days was to engage with the departments and request their help in providing me with recommendations for a limited number of focus growth areas, each of which we could support together. My part was to provide the needed faculty positions and the departments part was to search for excellent candidates. This operationalized the larger strategic approach.

In my view, this made sense - we were not going to hire people here and there, and we didn't need to hire anyone to do undergraduate teaching. So the question at each department meeting I attended was – "What are the areas where the department could use a few additional strong people to solidify its standing, what are the few topics where we could be much better, and what are the new areas of strength needed, areas where we could jump forward to become among the very best?" This was in my view what was needed to bring national attention to the departments and the school. I said to the departments that once we agreed on the focus areas, I would provide faculty slots so the department could hire clusters of faculty.

As is pretty much true with any organization, when new leadership arrives and has change in mind, people divide typically into three categories: those who ask, "How fast can I get on board and start running?"; those who take a wait-and-see attitude but are not actively opposed; and those who say, "Over my dead body!". In business, one usually has to get rid of the last third, with the proper notion that no one is indispensable. But that's not how it works in academia, and rightly so. Academic freedom and tenure are hallmarks of all great universities.

Also, when I arrived, there were just three overarching academic departments in the School – Applied Mechanics and Engineering Science, or AMES; Computer Science and Engineering, or CSE; and Electrical and Computer Engineering, or ECE. The fields of mechanical engineering, aerospace engineering, chemical engineering, structural/civil engineering, and bioengineering were all housed within the AMES department. Computer engineering was divided between CSE and ECE, a structure that still exists but today should be changed.

In order to recruit the strongest new faculty, it was my view that we had to follow the adage: "Walk like a Duck, Talk like a Duck, and Act like a Duck". We weren't doing much of this, which in meaningful part explained the Division's, and now the School's, ranking of engineering graduate programs at 44 in US News and World Report in 1993. What had to be done was to align the department names with recognizable fields and have more than three departments. The names had to be recognizable by any engineering dean or faculty member elsewhere. This would be an effort that would take six years to complete.

With these ideas in mind, the department that stepped up first was ECE – "How fast can I run"; the second was CSE – "I'll watch and see, but not oppose"; and the third was AMES, which took the view "Over my dead body". I worked with AMES over six years to make change, never harming the department but not necessarily moving as fast as this department might have liked.

Technology Revolutions Underway in 1994

There were two obvious revolutions underway when I arrived: the internet and wireless communications. These two revolutions were highly-coupled and the world has not been the same since the 1990's. San Diego was at that time at the center of the wireless and mobile phone revolution, led in large part by the then rapidly growing company Qualcomm. Qualcomm was in turn led by two co-founders, Irwin Jacobs as Board Chair and CEO and Andy Viterbi as CTO.

When I met with the ECE department and asked them to identify three areas of focus for growth, the department jumped at the challenge. It identified wireless communications, internet technology, and analog semiconductor chips and design as three of their core choices. It also meant that my job was to meet and get to know both Irwin Jacobs and Andy Viterbi.

San Diego was also a major bioengineering/biomedical hub, then and now. How best to reinforce this revolution began with establishing a Department of Bioengineering. This story comes later.

Partnering with Industry

The Corporate Affiliates Program and Research Centers that Raise the Value of the School to Industry

When I arrived, the Division had an Industrial Affiliates Program with just six companies, each providing just $5K a year. This shouted out, "industry doesn't value the School", and "the School doesn't value itself!" The School was clearly undervalued, and big-time change was needed. Thus began an effort that lasted throughout my tenure to build partnerships between the School and industry.

One way to begin changing this situation was to find areas where the School and industry could partner and add high value. It was obvious that we needed a strong effort in wireless communications, and the ECE department agreed – this would be one of our focus areas. I decided to meet the leaders in the region, and the leader of leaders was Irwin Jacobs.

I arranged to meet with Irwin Jacobs to hear his views on whether he thought forming an industry- supported Center for Wireless Communications was a good idea. He thought it was. But more importantly, I laid out my strategic view for the School for the next five years, and he liked that too. He said he'd help.

Irwin thought it was critically important to have a Center for Wireless Communications because the businesses in this market needed people, no doubt about it. We held a first meeting at the School with industry. It was led by Irwin and me with key ECE faculty, and it included companies such as Qualcomm, Ericsson, Sony, HP, Globalstar, and IBM, along with startup companies such as Silicon Wave, and local defense contractors such as Cubic Corp, ViaSat, SAIC, and General Atomics.

By 1995, we were ready. We established the Center for Wireless Communications with an initial six founding companies paying around $40K/year, and began to recruit four to five faculty, including a center director. This was the first and quintessential example of choosing a focus area and hiring a cluster of faculty.

This effort to build a program in an area of great interest to industry led many companies to see that the School can achieve big things, and we repeated this effort with industry in other fields such a bioengineering, earthquake structural engineering, and energy. Over time, companies wanted to be closer to the School, to participate in its programs, and look to recruit its students.

Over the years, I reached out to a wide swath of industries and companies. We immediately changed the Industrial Liason Program to the Corporate Affiliates Program, CAP, now with each company providing $25K per year. The CAP program continues to this day, is much larger than when I left in 2002, and illustrates the continuing importance and value of the Jacobs School to industry across the country.

Partnering with Foundations and Philanthropists

The United States has a long tradition of the wealthy giving back. From the days of the first Gilded Age in the 1870's, the philosophy has been that those who succeed financially within the system have an obligation to give back. From Carnegie's admonition in 1889 that if you die with your wealth, you die poor, to the Gates-Buffet Pledge in 2010, more than a hundred years later, that urges the wealthy to give back at least half of their fortunes, the United States has a cultural imperative to return to the society the wealth the society enabled you to earn and accumulate. For a history of philanthropy in higher education and science, technology, and medicine, see my 2021 paper in ISSUES in Science and Technology - https://issues.org/philanthropy-science-technology-unique-research-advantage-conn/ and its 2023 major follow on with co-authors Peter Cowhey, Josh Graff Zivin and Christopher Martin - https://ucigcc.org/wp-content/uploads/2023/10/conn-cowhey-zivin-martin_report_Oct.-2023_key-findings.pdf

Given this history and tradition of giving back, any leader of an academic institution understands and learns how to interact with great wealth, whether held by individual philanthropists or at foundations that were established by philanthropists. Well-known names in philanthropy abound and they range from Carnegie, Rockefeller, Mellon, Vanderbilt, Morgan, and their compatriots in the second half of the nineteenth century to today's entrepreneurs and leaders in technology and finance. Common among the names are Bill and Melinda Gates, George Soros, David Koch, Steven Schwartzman, Gordon and Betty Moore, Jim and Marilyn Simons, and so many high technology company founders and leaders in finance.

While in 1993 I had not had much experience working with foundations and philanthropists, I knew of their importance and made working with them a priority. As the story of the Jacobs School unfolds, you will see, for the first time on the general campus at UC San Diego (the medical school aside) that fund-raising at the dean's level from foundations, philanthropists, and industry play an indispensable role in the story. As a preview, key names are Irwin and Joan Jacobs as individual philanthropists, the Whitaker, Powell, and von Liebig foundations, and industries such as Qualcomm, Sony, IBM, Cubic Corp., Ericsson, and SAIC, amongst many others.

Chapter VI

Enhancing the Departments and Thereby the Entire School

The Department of Bioengineering

When I arrived in January 1994, a file awaiting my first major decision was sitting on my desk. It was about whether or not to support the formation of a new academic department, a Department of Bioengineering. At that time, bioengineering was program within the AMES department. I could feel it in my bones, based on diligence and visits with their leader Shu Chien over the past six months that this was an idea whose time had come. Here's why.

The proposal was led by Shu Chien, a member of both the National Academy of Engineering and the then Institute of Medicine (today, the National Academy of Medicine.) The initial faculty included extraordinary people such as Bert Fung, the "father of biomechanics", one of but a few members of all three branches of the Academy – Science, Engineering, and Medicine. The core eight faculty were extraordinary, yet this group was a program within the AMES department. (AMES is the acronym for Applied Mechanics and Engineering Science, and changing that name is another story.) The proposal had been through most of the approval steps, but the faculty Senate was awaiting my recommendation. It was time, and the right thing to do. In February 1994, I gave my approval, one of the easiest yet impactful decisions of my tenure as dean.

The bioengineering department already had a strategic plan and it had focus areas, such as tissue engineering. That first year, led by Shu Chien, the department received a Whitaker Foundation Development Award and in partnership with Shu, I would develop a good relationship with the leadership of the Whitaker Foundation. This would pay off with a very large grant for a new bioengineering building, but again, I get ahead of the story.

The bioengineering faculty had a few other areas where they wanted to build strength such as systems biology, computational methods in biology, and bioinformatics. We proceeded apace in 1994-1997 with cluster hiring in several areas, all stellar appointments. One of the first recruits was Berhnard Palsson, a systems biologist who over the years made major contributions to many aspects of bioengineering. Bernhard today is a member of the National Academy of Engineering, elected in 2006. We hired Sangeeta Bhatia as a young assistant professor of stunning talent. She stayed five years, but we lost her to MIT because the campus could not solve her "two body" problem – her husband had only a research position in the medical school. Yet she is indicative of the excellence in hiring at the time, and Sangeeta today is also an elected member of the NAE.

Around the time as Sangetta left, we attracted from the University of Illinois an already renowned systems biologist and bioinformaticist, Shankar Subramanian. And so the story went. All this hiring of superb faculty strengthened the department and built up the selected focus areas. But the department was getting much larger and sorely in need of space. Could we even imagine getting funding for a new building? That story will be told in Chapter X.

For a history of bioengineering at UC San Diego from the 1960's through the 2010's, see https://bioengineering.ucsd.edu/dept-history

The Department of Electrical and Computer Engineering

The ECE department proceeded almost immediately and with vigor in 1994 to engage in the wireless communications field across all its key elements. They too recognized the revolution under way. I consulted with Andy Viterbi and Irwin Jacobs and asked them to give me a short list of five people whom they felt were the best in the country, and who could serve as director of a Center for Wireless Communications (CWC). I shared this list with the department. On the list was Tony Acampora, then at Bell Laboratories.

ECE succeeded in recruiting Tony, and he became the Center's first director. He in turn gathered existing faculty to inaugurate the center and helped guide the recruitment of the remaining faculty cluster. As for industry, six companies agreed to join and support the Center at $50K a year. It eventually grew to about 15 companies, and over the years made an extraordinary impact. And with this, the first new Center was established within the School. This would set a model for other areas.

A key need in wireless communications as a whole is for analog semiconductor chips, and we had no one expert in this area. I remember Walter Zable, founder and CEO of Cubic Corporation, the defense contractor, telling me "Bob, where are the RF engineers? That's what we need." With the internet and digital computer revolutions, electrical engineering departments moved away from any focus on analog devices. Yet cell phones were "wireless" devices, and analog chips and digital-to-analog and vice versa circuits, plus signal processing chips are critical.

We had one star in this area, Peter Asbeck. The department asked Peter to lead a search for a new senior faculty member, and one of our first hires was a leader in this space, Larry Larsen from Hughes Research Labs. He made an enormous difference. Together with the hiring of Tony Acampora, we were on our way.

Over time, this group was enhanced with the hiring of a number of new faculty, Illustrating the "cluster hiring" strategy. This sent a message within the School that this is what could happen when a department identifies a key area and moves strongly to build it. The pattern would repeat itself elsewhere, but I'm indebted to the ECE department for being the one to say, "How fast can I run!"

Another feature of building such strength is that once we had deep strength, very strong new hires would balance out any losses. For example, the ECE department hired a senior star, Gabriel Rebeiz, in 2005 from the faculty at the University of Michigan. Rebeiz is a National Academy of Engineering member (elected in 2016) who is renowned in the area of silicon design of RFIC chips, tunable filters, and antennas, similar to areas covered by Larry Larson. Later, in 2011, Larry Larsen himself would leave to become dean of engineering at Brown University. (That by the way is a feather in the Jacobs School's cap.) All this is an illustration of how one sustains high quality and rankings over time. By the time Larsen departed, the School was more than strong enough to suffer little overall Larsen's loss, as disappointing as that was. This is the new "normal", and very much like what occurs at other top-ranked places.

Needless to say, we succeeded in hiring many additional faculty, some senior and some junior, to give us immediate visibility, all while laying the foundations for a long-term successful program. Over time, cluster hiring in focus areas became the norm, to great impact. As another example, the ECE department was already strong in communications and information theory, with faculty such as Larry Milstein and Andy Viterbi (adjunct professor), but we doubled down and added stars such as Paul Siegel from IBM research and Alon Orlitsky from Bell Labs. In

VLSI and transistors, we hired Andrew Kahng from the faculty at UCLA, Bill Lin from IMEC, Europe's largest independent microelectronics and Information technology center, and Yuan Taur from IBM. We enhanced the joint computer engineering program between ECE and CSE by hiring Dean Tullsen into the CSE department as part of the cluster of new hires.

An important element in the strategy was a negative one - do not build on weaker groups. For example, ECE at the time had a group in systems and controls, both theory and experiment, but it was not strong. It proved a better approach in my view to start anew in this important area with an a newly enhanced program in the AMES department, and that is what we did.

Finally, the strengths we added in ECE (and CSE) would become a cornerstone in 2001 to the campus winning a state-wide competition and forming the California Institute for Telecommunications and Information Technology. By then, we were already a burgeoning powerhouse, and just prior to this State initiative, we had hired Larry Smarr, director of the University of Illinois supercomputer center, to join the faculty of CSE. Together with Ramesh Rao, now a senior faculty member in ECE, he would lead this extraordinary example of "seizing the day". I'll describe that story in its own chapter.

For a history of electrical and computer engineering at UC San Diego, see https://www.ece.ucsd.edu/about/history

The Department of Computer Science and Engineering

The Computer Science and Engineering Department (CSE) was widely known for developing UCSD Pascal in the early 1970's. UCSD Pascal provided students with a common environment that could run on any of the available microcomputers of the time, such as the DEC PDP-11. The operating system became known as the UCSD p-System. The department was strong in areas such as computer theory, computer architecture, compilers, embedded systems, and software engineering. Yet when I arrived, CSE was chaired by Gil Williamson, a mathematics department professor brought in to quell factions and get the department operating as a more congenial and coherent whole. To his great credit, this is exactly what Gil did.

With Gil, we got the department to move ahead more collectively, and one major key was to offer the department the opportunity to move ahead if it could agree on focus areas with cluster hiring. This brought some extraordinary new faculty to campus, and new senior leadership. In particular, we hired Jeanne Ferrante and Larry Carter from IBM (married, so we solved the “two-body” problem). Larry was particularly attracted to campus by the presence of our San Diego Supercomputer Center. Both were experts in compilers, and Jeanne soon became department chair. This would make all the difference, succeeding Gil Williamson, and reinforcing harmony amongst the faculty.

With this, the department identified focus areas and consistent with our strategy, we hired in clusters. We were strong in theory but needed to enhance that strength. Building around Christos Papadimitriou, we hired Mihir Bellare from MIT, Pavel Pevzner away from USC, and Alon Orlistsky from Bell Labs. The department was strong in networking and systems but could use more strength in internet security, so we hired a stellar young faculty member in Geoff Voelker.
The Voelker hire proved critical to later attracting Stefan Savage, a world-renowned expert in network security who today is a member of National Academy of Engineering.

In VLSI and computer engineering, we needed a star and recruited Andrew Kahng from UCLA plus a young person in Dean Tullsen from the University of Washington. In a few years, we enhanced these areas by hiring Andrew Chien, whom we recruited as a young full professor from the faculty at the University of Illinois. Andrew was already a star in computer architecture, and the letters of reference made clear he was held in very high regard. Andrew is an example of something we did often during my tenure – hire relatively young full professors who had already shown their mettle and who would be strong additions for many years to come.

I think you get the point – we hired well, we hired in clusters, and the department really moved up.

Jumping ahead a bit to the late 1990’s, we had a major loss when computer science theorist Christos Papadimitriou was recruited to UC Berkeley. This was something akin to losing Larry Larsen to Brown. Yet now, with the strength we had built, we could attract a stellar replacement. This we did. With the help of chancellor Bob Dynes, a former Bell Labs scientist, we recruited Ron Graham, Bell Labs' chief scientist. Graham was a distinguished mathematician in discrete mathematics and computer science, and a member of the National Academy of Sciences. In parallel, we recruited Fan Chung from the faculty at the University of Pennsylvania, a renowned graph theorist who was married to Ron Graham. As in other cases, we solved this "two body problem", and more than evened the score.

This example by the way supports the notion that once one achieves a sufficiently high reputation, you win more recruitments than you lose. This happened again and again as we competed with the likes of Carnegie Mellon University for young people and the University of Illinois where we recruited several relatively young but distinguished full professors. One particular recruit to come from Illinois in 2000 was Larry Smarr, a terrific recruitment. More on this story later.

So I repeat the key takeaway - once your reputation is strong, when you lose a star, there's another you'll find of equal brightness whom you can attract into your orbit. Excellence begets excellence.

For a history of the CSE department, see https://www.youtube.com/watch?v=II5bUKJE9oY.

A Case of Saying NO in order to say YES

National Science Foundation and the Computer Science Infrastructure Project

The CSE department had many strengths and a good reputation when I arrived, and yet it had never been awarded an NSF Infrastructure Project grant. Such a grant was viewed as a requirement for any top CSE department. This needed correcting.

During my first and second year, and outside of my attention, the department proceeded as it had before, assigning a faculty member to write such a proposal. Each failed. In 1996, when the department again proposed to proceed the same way, I realized the issue and said "No". What was needed was a faculty member to be given one year release from teaching so as to be fully dedicated to leading and writing the proposal on behalf of the department. The faculty were a bit shocked, but they agreed. No one had apparently ever said “No”.

In 1996, with my support for a year-long release from teaching, the department chair Jeanne Ferrante identified a young star full professor, Joe Pasquale, to lead the proposal, and she implemented the plan. She also became a co-investigator on the proposal with Pasquale.

The vision was for a next-generation Active (World Wide) Web that was no longer just passive (i.e., acting solely in response to user requests, which was how things worked at the time), but had active entities such as software agents that continuously did things on their own to improve the system as a whole. It had video and audio objects that could be activated and embedded in multimedia documents which users retrieved (or submitted), and whose support was driven by a market economy, i.e., information and program activations could be bought and sold in a highly decentralized way, and by users themselves. And finally it had security as an integral part of the design. The web of 1996 seems like the dark ages, and it was. The Active Web project was aimed at changing the situation.

The department was indeed finally awarded an NSF Infrastructure Grant for the Active Web Project, and we were told that the proposal had the highest ranking of all proposals submitted that year. The department now had all the elements needed to become ever stronger over time.

The Department of Applied Mechanics and Engineering Science

When I arrived in January of 1994, my own faculty position was in the AMES department. I was an expert in both nuclear and fusion energy and was joining an historically superb group built by Sol Penner and Forman Williams in the area energy and combustion areas, fluid mechanics, and applied mechanics. Senior faculty included some stunning people: In addition to Sol, there was Bert Fung and Shu Chien in bioengineering; Forman Williams, Paul Libby and Juan Lasheras in fluid mechanics and combustion; Eric Reissner and Sia Nemet-Nasser in applied mechanics and materials; and Gil Hegemeir in structural and earthquake engineering. Gil Hegemeir would subsequent hire Frieder Seible and Nigel Priestly into the structures and earthquake engineering program and turn it into a nationally recognized group. Summary – this founding group was a powerful set of scholars.

Because of Sol and the quality of his hiring, the department had the most members of the National Academy of Engineering of any of the departments in the School in 1993. And when I arrived at the start of 1994, many of these founders were still active, and most were married deeply to the idea of engineering science, the founding roots of the department. They had little interest in identifying themselves with more recognizable names such as Mechanical Engineering, Aerospace Engineering, Civil and Structural Engineering, Materials Science and Engineering, though they were open to Bioengineering.

This reluctance to change is what I meant earlier when I described the metaphor of how people react to the prospects of new leadership and change – some say how fast can I run; some say I'll watch and see but won't object; and some say, "over my dead body". If ECE fell into the first category and CSE into the second category, AMES fell into this third category. Yet in my view, if you don't walk like a duck, talk like a duck, and act like a duck, it's hard for outsiders to call you a "duck", that is, to rank a group in the traditional categories into which rankings fall.

This would take patience to rectify, yet in my view, rectification would allow the department to achieve external recognition consistent with its intrinsic strengths. I determined to be patient, to support the department in the interim so long as we added strength consistent with the strategy of focus and cluster hiring.

One area of obvious focus was energy research. With my coming and bringing a large group, we could with some hiring become the leaders in fusion energy engineering. This we did. Key hires included George Tynan from industry in magnetic fusion plasma physics and engineering; Sergei Krasheninnikov from MIT in plasma theory; and Ferhat Beg from Imperial College, London in high energy density pinches and laser-plasma interactions (laser fusion).

In an example of across departmental hiring to cover the bases in a focus field, we also hired Farrokh Najmabadi, a leader in fusion engineering and reactor systems design into the ECE department. Over time, George Tynan would come to inherit my experimental program in plasma-surface interactions, and of course create his own program, now in experimental plasma turbulence research. Farrokh would assume the leadership of the national fusion reactor design program now centered at UC San Diego. With this, the transfer of strength from UCLA to UC San Diego was complete.

The second area of great existing strength in AMES was earthquake engineering. The group was stellar and with a few additions to the faculty and support from the state and foundations, particularly the Powell Foundation, they would grow while remaining the clear leaders.

Finally, dynamic systems and controls is a key field in both mechanical, aerospace, and electrical engineering. This area had been strong within AMES, but key faculty had left, and as I noted earlier, the group in ECE was not at the top of their game. We could correct this with cluster hiring, and the AMES department was supportive. The plan was to recruit a renowned leader and allow that leader to guide the growth of the cluster with additional faculty hires. That leader turned out to be Robert Skelton from Purdue, and Bob indeed led all that followed.

Bob Skelton was already a widely respected leader in systems and controls, and he would be elected a member of the National Academy of Engineering in 2012. He was renowned as the principal pioneer in the field of tensegrity, the concept of isolated, compressed components within a network of chords or struts that are under continuous tension. This field is crucial to the successful engineering and design of structures ranging from space telescopes to robots to, believe it or not, red blood cells. As importantly for what was needed at UC San Diego, Bob was known to have good taste in people, and he was himself famous enough to be an attractor to UC San Diego.

In 1996, we successfully recruited Bob from Purdue where he had been for twenty-five years. The attraction for him was that he could lead the hiring of a cluster of faculty to create a powerful research enterprise. Over the next several years, the department hired a second senior leader in Robert Bitmead, and several young assistant professors such as the experimentalist Raymond De Callafon and the theorist Miroslav Krstic. Today, both are recognized stars in their fields.

So once again, identifying a focus area and hiring in a cluster brought extraordinary faculty to the School, provided relatively immediate recognition of the strength of the group, and raised the profile of the entire department.

For a history of the AMES department written by its founder, se Sol Penner: https://mae.ucsd.edu/about/history#:~:text=At%20UCSD%2C%20AMES%2C%20under%20the,a%20new%20field%20of%20Bioengineering.

Chapter VII

A Department Fissions for Long Term Benefit

Applied Mechanics and Engineering Science (AMES) Fissions into Two

About four years into my tenure, and with the structural engineering program within AMES having grown as a result of their focus on earthquake engineering, a serious discussion within the department about splitting began to take please. I had been patient and was now supportive, even though one of the departmental names would not be a common one. The departments would become the Department of Mechanical and Aerospace Engineering (MAE) and the Department of Structural Engineering. MAE is clear and common, but structural engineering is not common. Yet I did not see the ability for us to invest in the number of faculty necessary to become a top-notch civil engineering department, the recognizable name. That would require many other disciplines.

Sol Penner, the founder of the department, describes well the situation in the late 1990's. So I quote him from his history of the AMES department. The web link was given earlier.

"When I was AMES Chair, there was some sentiment within the department for retaining the acronym, but our strong Dean of Engineering insisted on a clean split with different names, and so the acronym disappeared, and we now have MAE, which really is not an acronym, since no one calls it 'may'."

"I appointed Frieder Seible and Juan Lasheras to head up the split into two departments, with Frieder championing Structures and Juan MAE. Since departments of MAE were prevalent through the country, Juan's choice of a department name was comparatively easy, but Frieder had some trouble convincing everyone that we should establish what I think was the first Department of Structural Engineering in the country. It helped him to win when he pointed out that the name was not unusual in Europe and indeed, the Structural Engineering Department, founded as the first department of its kind in 1999, has become the world's leading program for large-scale structural testing and earthquake safety engineering."

“I must say that seeing Juan and Frieder negotiate for resources during the split made quite an impression on me, and it strengthened and solidified my respect for both of them. At times I thought they were coming to blows, but after all, they turned out to be among the best of friends. That was an early demonstration of their excellent administrative abilities, which they both have gone on to demonstrate clearly since that time.”

The good will amongst the faculty that had emerged by my taking the position of patience, and providing support for the energy and controls areas, had brought us to a good place. This resolution of a long-standing desire to create departments with more recognizable names is a story not likely to be found in industry, where patience is not considered a virtue.

For a history of structural engineering and the department at UC San Diego, see: https://se.ucsd.edu/about-us/history

Chapter VIII

The Re-Competition of the National Science Foundation Supercomputer Centers Program

A National Event of Great Consequence for the School and the University

UC San Diego operates one of the nation's small number of powerful supercomputer centers, the San Diego Supercomputer Center (SDSC). SDSC is both crucial to the advancement of science and technology around the country, important for the reputation of the Computer Science and Engineering Department on campus, and for the campus' overall standing amongst universities globally.

Background to the Establishment of SDSC

The National Science Foundation (NSF) Supercomputer Centers were first established in 1985. The drive came partly from the University of Illinois, led by Larry Smarr, an astrophysicist; from General Atomic, partnered with UC San Diego, and led by Sid Karin of GA, a nuclear engineer; and partly from Cornell, led by Ken Wilson, a Nobel laureate in physics. Larry and Ken were the voice of the computational science community. In the San Diego case, the idea for a supercomputer center was Sid Karin's, an engineer, and he brought it to Harold Agnew, then CEO of General Atomic (later, General Atomics, or GA). Agnew agreed with Sid to involve UC San Diego and Sid enabled this partnership to occur. UC San Diego was in turn fully supportive but did not have the on-campus strength in high performance computing to provide leadership. And so a partnership was formed, with Sid Karin and General Atomic in the lead, and UC San Diego as the partner.

This arrangement of an industry leading a proposal to the National Science Foundation (NSF) was and is unusual. The NSF historically provides its support to universities, and all the other proposals for a supercomputer center were led by universities. So while Sid Karin's leadership on the technical front was paramount, it would be important to convince NSF that GA being in the lead was acceptable.

Both Illinois and GA-UC San Diego made the case to NSF that such centers were needed in support of the high-performance computing needs in most all research fields. They each submitted an unsolicited proposal. GA and UC San Diego, led by Sid Karin, proposed a San Diego Supercomputer Center (SDSC) with networking as a prime feature and including as nodes the sites of partner universities. This was a unique feature. Importantly, General Atomic was already a node on the Magnetic Fusion Energy supercomputing network of the Department of Energy (DOE). By linking the SDSC network of about twenty universities to the MFEnet node at General Atomic, SDSC had an instant international network. Rather brilliant.

NSF decided not to support the unsolicited proposals but rather to put out a national call-for-proposals for such supercomputer centers. It received 23 proposals. The two unsolicited proposals won, and each was funded.

In the end, three other proposals were also funded - at Cornell, at Carnegie Mellon University partnered with Westinghouse, and at Princeton University in a partnership with other universities. At the five-year review point, in 1990, the center at Princeton was not renewed but those at Illinois, GA/UC San Diego, Cornell, and CMU/Westinghouse were renewed.

When I arrived in 1994, the Computer Science and Engineering Department was ranked in the top twenty and the presence of SDSC was an important factor in our national presence in computing. It was without doubt an important asset on campus. But as already noted, GA was the principal investigator, not UC San Diego.

The 1995-1997 NSF Supercomputer Centers Recompetition

As the 10th anniversary approached (1995), the NSF, as is its wont, indicated it would conduct a re-competition to seek new directions for the now four centers, and perhaps add to, or subtract from, the existing centers. The latter however seemed unlikely because of the enormous infrastructure of computing that had been put in place at these four sites after a decade of investment.

In the University of Illinois case, that infrastructure was on the campus of the university. In the case of CMU and Westinghouse, CMU was the principal investigator while the center's computing infrastructure was located at

Westinghouse's site in Monroeville, PA. At Cornell, the supercomputer enterprise, named the Cornell Theory Center, was led now by Malvin Kalos, a mathematician well known for his work in Monte Carlo methods, and it was housed on Cornell's campus. In our case, GA was the principal investigator, UC San Diego the partner, but the computing and networking infrastructure were housed in the SDSC building on campus, a building that had been built with GA project funds.

I had known Sid Karin from the time he was a graduate student in nuclear engineering at the University of Michigan. His Ph.D. thesis advisor was Jim Duderstadt, my graduate school office mate at Caltech. Importantly, after the GA-UC San Diego proposal won in 1985, Dick Atkinson recommended that Sid Karin be appointed an Adjunct Professor in the CSE department. That would have important implications in the coming 1995-1997 re-competition.

While never saying so directly, there were signals to Sid and others that the NSF much preferred the CMU-Westinghouse model where the PI was a university, CMU. Bob Dynes was now Vice Chancellor for Academic Affairs and of course the CSE department was in the School. So while we both had some oversight over SDSC, the center reported directly to Dick Attiyeh, the Vice Chancellor for Research.

We discussed the center's renewal and its needs with Sid, who indicated to us that it might be necessary for UC San Diego to switch roles with General Atomic and become the PI for the renewal proposal. This would not be an easy decision, nor did we believe it would sit well with GA. On the other hand, if we did not change, there was a better than even chance that we would not prevail.

In the end, it was Bob Dynes' decision, and that decision was for UC San Diego to lead as Principal Investigator. Bob took responsibility and organized a meeting with the CEO and principal owner of GA, Neal Blue. Afterwards, Bob indicated to me that the meeting had been a difficult one.

Tensions were high. At GA, Sid Karin knew it was necessary for UC San Diego to lead, and he so informed Neal Blue. In the end, Blue removed Sid as Director of SDSC and brought in a replacement director. GA clearly did not want this switch in PI, and in the end, they would submit a competing proposal for SDSC renewal to NSF.

Decision Time

What to do? I asked to speak with Sid, and we met to discuss a way forward. As I mentioned, Sid Karin was already an Adjunct Professor in CSE so he had an appointment, and we could readily bring Sid to campus from GA. We would of course have to support his salary. This we did, though not including any bonus Sid was receiving at GA. Nonetheless, Sid accepted.

Sid, with a small team that left GA for UC San Diego to join him, led the writing of the re-competition proposal. It turned out to be a stellar proposal, and we prevailed. GA did submit its own proposal, but it was rejected. Sid was told by NSF staff that in fact the UC San Diego proposal had been ranked #1, again.

GA was now not much in the picture but many of the SDSC employees worked for GA. The question again was how best to proceed. Sid recommended that the university make offers of employment to all SDSC employees at GA, and most accepted. Some chose to remain GA employees but work at the Center on campus. This became the way forward.

While university-industry partnering was crucially important to me and to the School, this was a decision that had to be made in the best interest of winning a very large proposal crucial to the future of computing and of the campus. Relations with GA remained frosty for some years, an unfortunate outcome of a hard decision.

Sid Karin, I must say, is the true hero of this story. Sid stayed true to his views about the best path forward for SDSC. He had the courage to act on those views despite his own loss of employment, in part because he had a vision for the next phase of SDCC. It was a powerful vision, and in the end, he and we landed on our feet.

Sid remained director for another five years, from 1997 to 2001, and is now Professor Emeritus of Computer Science and Engineering at UC San Diego. Today, SDSC continues as one of the leading centers for high performance computing and networking in the country. It is known for performing leading research and shines a strong reflected light on the CSE department.

Chapter IX

The School is Endowed and Becomes the Irwin and Joan Jacobs School of Engineering

Philanthropy at its Very Best

Around 1995, in his last year as Chancellor before becoming President of the UC System, Dick Atkinson indicated to me that he had suggested to Irwin and Joan Jacobs that they might consider a naming opportunity – the School of Engineering. This was striking. In my vision of a premier School, a name is key – it gives one a chance to really create a brand. And with a brand name, e.g., the Jacobs School, you automatically have something distinctive and memorable.

By 1997, I'd come to know Irwin well, working with him to create the Center for Wireless Communications and seeking his advice on the very best potential faculty people in that broad area. I also knew Joan Jacobs very well, bonding over our love of contemporary art. It didn't hurt that she was from Manhattan while I was from Brooklyn – two New Yorkers. There's a certain cultural understanding. Indeed, a bit later on, we often made trips together to see art galleries in New York or Los Angeles. Time spent as friends.

Bob Dynes was now chancellor at UC San Diego and sometime in late 1997, he hosted a dinner at the Chancellor's Residence. I can't recall the occasion, but such events were not uncommon. Guests were seated at round tables of eight and generally it was a wonderful evening, a time to talk with friends and acquaintances, and stay fully engaged.

I was seated at the Chancellor's table, with Bob Dynes and I on either side of Irwin. Joan couldn't make it that evening. Somewhere along the line, during a quiet moment at dinner, Irwin turned to me and said in a calm voice – "Joan and I are ready." Bob and I looked at each other, both understanding what Irwin meant, and believe me, I didn't say "We'll get back to you"- no - I said, "Wonderful Irwin, we'll be in touch right away to get this worked out!" For the School, I was ecstatic, and so was Bob Dynes.

While it had been two years or more since Dick's heads up, I think what happened is that the Jacobs' watched. They watched what was happening at the School, they saw the major changes that were now well underway, they followed the rise in the rankings, and they could feel the momentum we had. In parallel, Qualcomm kept doing better and better. As Irwin later relayed to me, by late 1997, he and Joan felt more certain that both the School and Qualcomm were on their way. There was no looking back, and the time was right for an endowment gift.

Over the following months, we worked with Irwin and Joan to establish an initial endowment gift amount of $15 million, and the terms of an agreement. By February of 1998, the university announced that the School would now carry their names: **The Irwin and Joan Jacobs School of Engineering.**

Just extraordinary, and over the next five years, the Jacobs would commit to providing another $110 million for the School's endowment. They also agreed that until all the funds were received, they would commit to providing the School annually with an equivalent endowment payout of about 5%. This meant we could proceed as if we had the full endowment amount, allowing me as Dean to have significant discretionary funding to build the departments further, to drive faculty recruitment, to support new initiatives, and to put in place programs that would help attract the best undergraduate and graduate students.

Joan and Irwin were keen on us establishing a program of Undergraduate Jacobs Scholars and Graduate School Jacobs Fellows, a program to help the School attract the very best students. They agreed to provide the funds to underwrite these student programs. At the undergraduate level, ten students each year are selected for full four-year undergraduate scholarships including all fees, and on-campus housing for four years. At the graduate level, ten one-year full graduate fellowships would be awarded each year. This produced at steady state an on-going cadre of about fifty Jacobs Scholars and Fellows.

Over time, this program of student support has helped the School attract some of its finest students, and the program remains a powerful tool to this day. I describe it further in section XIII.

Chapter X

Partnering with Foundations to Make a Difference

Over the decade of my deanship, working with donors, both individuals and foundations, proved central to our success. Foundations focused on science, technology, and medicine in the United States make an enormous difference. The Jacobs School during my tenure partnered with three relatively lesser-known foundations, yet they made all the difference: The Charles Lee Powell Foundation, established in 1954, based in San Diego, and still active; The U. A. Whitaker Foundation, established in 1976 and active for thirty years through 2006, shutting down after spending all its endowment; and the William J. von Liebig Foundation, founded in 1996, based in Florida, and now inactive.

These three foundations are examples more generally of three categories of foundations in the United States. The Powell Foundation was established with an initial corpus of funds to establish its endowment. It set an approach to investing the corpus and paid out about a 5% each year to fund its programs. It planned to operate in perpetuity, and it continues to this day.

The Whitaker Foundation was set up in the same way but with the family of the founder involved. In the mid-1990's, the family made the decision to spend down its endowment corpus over a time and in such a way that it would discontinue operations when the last person to personally know the founder, U.A. Whitaker, would likely have passed. That end point came in 2006.

Finally, in 1975, William von Liebig, who in 1961 founded Meadox Medicals, Inc., created The William J. von Liebig Foundation, to support medical research, primarily for the treatment of vascular and cardiovascular diseases. Von Liebig died in 1999, and a decade later his foundation would cease operation. But upon his passing, an opportunity for the School appeared. Shu Chien of bioengineering had been close to William von Liebig and knew the players. The lead person at the foundation had been personally close to William von Liebig but had little experience running the foundation. She thus brought on an advisor. We had an idea to propose to them, and moved to seize the day. That story is coming.

In each case, with Powell, Whitaker, and von Liebig, our approach was tailored to their interests and to their operational structure, all the while meeting a major need of the School.

Partnering with the Powell Foundation on Earthquake Engineering and Endowed Chair Professorships

The Charles Lee Powell Foundation was established in 1954 and set up to fund private universities in California. These were Caltech, Stanford, and the University of Southern California (USC). When I arrived in 1993-94, the foundation had already decided to add one public university, UC San Diego, as there was no private research university in the San Diego region.

During the 1980's, Gil Hegemeir and Frieder Seible from the structural engineering group within AMES had established a program in earthquake engineering. What they envisioned at that time was a facility with a large shake-table capable of testing the response of structures to simulated earthquakes. The Powell foundation generously provided a major grant in the mid-1980's to construct the Powell Structural Engineering Laboratory, a large experimental hall in the middle of campus. This proved prescient in its timing.

The major San Francisco earthquake of 1989 did enormous damage to buildings and infrastructure, especially to the San Francisco Bay Bridge and the double-deck Cypress Freeway in Oakland, which collapsed. The Powell Laboratories at UC San Diego would become the State's workhorse center for testing how best to make freeway columns more earthquake resistant, how to reconstruct the Bay Bridge, and how to make the construction of buildings safer. Much of the retrofitting of structures was first tested and standards created based on work in this Laboratory.

Getting to know the board members of the Powell Foundation was key, and this I did. Two people on that board at the time knew me well, Joel Holliday and Harold Agnew. Joel was CFO of AMCC, a semiconductor company that did very well during the wireless communications boom of the late 1990s. AMCC was a member of our Center for Wireless Communications and a member of our Corporate Affiliates Program. The other person, Harold Agnew, I knew from his days as CEO of General Atomic (GA) and as a key person behind helping GA and UC San Diego succeed in the 1985 NSF supercomputer center competition.

In 1994, the Northridge earthquake hit in Los Angeles and the need for much expanded testing facilities became acute. Now knowing the board of the Powell Foundation well, we were able to have them step up again and provide additional funding. That funding was augmented by the State of California and the National Science Foundation, and a second structural engineering laboratory built. This time, the facility was built at a UC San Diego field station east of campus to house the largest earthquake shake table in the country, one capable of testing full scale structures. The lab opened in 2002 and was later endowed with a gift from the Englekirk family to become the Englekirk Structural Engineering Center. The NSF recently funded another upgrade that enables the facility to have a full six degrees of freedom yielding even higher fidelity simulations.

Overall, the Powell Foundation catalyzed the building of earthquake engineering laboratories and the structural engineering program at the Jacobs School. The result, then and today, is that structural engineering is extraordinary at UC San Diego. It is highly ranked as a department, and the earthquake engineering program and testing infrastructure is amongst the very best in the world.

The Powell Foundation would also help the School with endowed chair professorships and with infrastructure needed for bioengineering. The latter initiative involved partnering with the School on a major proposal to another foundation, the U.A. Whitaker Foundation, for a building to house the department of bioengineering. This story comes right after the next discussion about the School and its relationship to the Whitaker Foundation.

Partnering with the Whitaker Foundation in Support of Bioengineering

The Whitaker Foundation began upon the death in 1975 of U. A. Whitaker, the founder of AMP Corporation, based in Harrisburg, PA. His wife Helen, who shared in his philanthropy during his lifetime, joined him in bequeathing a significant portion of her estate to the Foundation when she died in 1982. Throughout its thirty-year history, the Foundation primarily supported interdisciplinary medical research, with a focus on biomedical engineering. It contributed more than $700 million to universities and medical schools to support faculty research, graduate students, program development, and the construction of facilities. In the mid-1990's, the Jacobs School would have a catalyzing influence on the Whitaker foundation with respect to its program to help construct buildings for bioengineering across the country.

Beginning in the 1990s, the foundation decided to focus on the newly emerging departments of bioengineering in the country and, as has been described, we had one of the very first departments. In the previous year, Shu Chien led a proposal to the Whitaker Foundation for its newly established Development Award to enhance the department's biomedical engineering program. A year later, they made a second such award. Bioengineering received two $5 million grants, the largest to that point made by the foundation.

Catalyzing a new Whitaker Foundation Program to support the Bioengineering Infrastructure needs (mainly buildings) Across the Country

During a site visit in 1995 for the Whitaker Development Award grants, we learned for the first time that the foundation intended to spend down its endowment corpus over the next decade or so. The closing of the foundation was to be approximately timed with the time when the last people who personally knew U.A. Whitaker would have passed on. Yet in 1994, the foundation had a corpus of $700 million. It was clear to me that there was no way they could spend down that amount of money in ten to fifteen years with the programs they had in place. The largest grant they made at the point was the Development Award, generally $5 million spent over several years.

Shu Chien and I discussed what else we needed for our new bioengineering department. The answer was clear - a building to house the department and its laboratories. As it turns out, departments of bioengineering were beginning to emerge around the country, and they too would all need buildings.

I had a conversation with Shu early in 1995 about the idea the one way the Whitaker Foundation might spend down its corpus was to fund bioengineering infrastructure here and elsewhere. It was certainly something we needed. Shu agreed. We planned to brooch this subject with the foundation during an upcoming site visit.

The president of the foundation, Peter Katona, members of its board, and other family members would make site visits to UC San Diego to review our Whitaker Development Awards activities. During their visit in the Spring of 1995, I asked the president, Peter Katona, if Shu and I could meet with his leadership group to discuss another idea we had. We confirmed their plan to spend down the corpus over the next decade or so. That allowed us to follow up and explain that there was a major national need for bioengineering buildings around the country. We the also pointed out the inconsistency of their wanting to expend their corpus supporting only the grant programs they already had. They needed a new program.

We had a proposal. Would the foundation consider supporting the construction of bioengineering buildings, the infrastructure needed for bioengineering departments across the country? We said that this new program would require $15-20 million per grant. In this way, Whitaker could meet a national need and now be consistent with their plan to spend down their endowment over a decade or so.

The Whitaker group was taken by this idea and asked that we send them a “white paper” proposing such a program. This we did, led by Shu Chien. The foundation let us know in the fall of 1995 that their board had met, considered our white paper, and agreed that the foundation should establish a program to support the construction of bioengineering buildings. We were thrilled, for us and for them. But, they said, you at UC San Diego will have to compete for this award along with others.

We were ready. This is among many examples over my nine years of the “seize the day” mantra, an example of meeting your own needs in a timely way, and sometimes meeting the needs of many others.

The Powell Foundation and the Whitaker Foundation Join Forces for the School

The department of course would submit a proposal but now the question was - how to make the proposal as compelling as possible? Here is where my personal relationship with Powell Foundation board members came into play and made the day.

I knew Herb Kunzel, chair of the board of the Powell Foundation, from his visits to review our Powell earthquake engineering program. I also knew well two of its board members, Harold Agnew and Joel Holliday. I asked to speak with the Powell board at their headquarters in La Jolla, and explained the proposal we would be making to the Whitaker Foundation - to provide major funding for a new bioengineering building. My "ask" of them was for the Powell Foundation to commit, ahead of time, to providing substantial funds for this building project as a signal of our willingness to provide matching funds should we prevail.

After careful consideration, the Powell board approved my request and said they would provide $3 million. But they had a condition. Should we win, they wanted to have the building named for Charles Lee Powell and San Diego Superior Court Judge James L. Focht, a close associate of Herb Kunzel.

We were appreciative but concerned that the Whitaker people would want the building named for U. A. Whitaker. Shu had a suggestion. What if we established an Institute for Biomedical Engineering to be housed in the new building and named it for Whitaker? Brilliant!

I called Peter Katona and explained how we now had a commitment for significant matching funds, but this "first-mover" donor had a request – they wanted the building to bear their name. I explained that we would establish the Institute for Biomedical Engineering, name it for Whitaker, and house it in the new building. With remarkably little resistance, Katona agreed.

And so we submitted a proposal for a total of $16 million, $13 from Whitaker and $3 million from Powell. We noted in our proposal that while this would permit construction of a building, that building would house only two-thirds of the bioengineering department. (We were afraid to ask for too much.)

In 1996, we were notified that we had won. Whitaker also funded a second proposal, from Johns Hopkins, so we and Hopkins were the first awardees.

And now the most amazing part of this story. While our proposal was more than compelling enough that we would win, each foundation asked us how much more it would take to house the entire bioengineering department in the building? When told the answer was another $10 million, each foundation agreed to provide an additional $ million, with no new proposal required. That meant we would receive $18 million from Whitaker and $8 million from Powell. With that, we were done.

I guess the lesson is - never be afraid to ask for what you really need!

The building, named the Powell-Focht Bioengineering Hall, became the first privately funded academic building on the UC San Diego main campus (excluding the medical campus and the SDSC building). All buildings up to that point on campus were state funded through bond issues. The SDSC building had been de facto built with NSF funds as a pass-through for the building on campus. Now, a new pathway for the campus had been established.

In the end, what turned out to be as important as winning was that this program of the Whitaker Foundation would now be a national one – it would fund buildings for bioengineering across the country. So not only did UC San Diego win, and Hopkins win, but others around the country now knew their opportunity would come. Over the next decade, many new bioengineering buildings were funded in whole or in part by the Whitaker Foundation. And indeed, in 2006, the Whitaker Foundation would announce that it had expended the bulk of its endowment corpus and would cease operations. They too had achieved their goal.

The William von Liebig Foundation Initiative in Entrepreneurism

In 1975, William von Liebig, who in 1961 founded Meadox Medicals, Inc., created The William J. von Liebig Foundation to support medical research, primarily for the treatment of vascular and cardiovascular diseases. As it turns out, Shu Chien is renowned for his contributions to the physics of blood flow and for applying this knowledge to better diagnose cardiovascular disease. That mapped well against the interest of von Liebig. As a result, Shu had a relationship with Meadox Medical and knew William von Liebig fairly well. After von Liebig died in 1999, the successor leader of his foundation wanted to do something big to honor von Liebig. Once again, Shu had a brilliant idea.

San Diego is widely known as a biotech hub, with many startup companies and a few large ones such as Illumina. The feeder source of these biotechs are three major research enterprises: UC San Diego, with very strong programs in biology, chemistry, bioengineering, neuroscience, and medicine, and which has a medical school; The Scripps Research Institute (TSRI), with strengths in chemistry and biochemistry, neuroscience, infectious diseases, and drug discovery, and which is affiliated with Scripps Medicine and its hospitals; and the Salk Institute for Biological Science, founded by Jonas Salk, with a rich history in basic biological sciences research. These three institutions and the two affiliated medical centers are located essentially "across the street" from each other on the La Jolla mesa.

Given the entrepreneurial nature of the faculty and the surrounding biotech and biopharma companies, Shu had the idea for a center for entrepreneurship that would become a hub to provide help and guidance to those faculty or graduate students keen on translating discovery into products. The center's purpose would include providing early-stage commercialization assistance to startups that emerge from campus.

We developed this idea together with John Watson, an adjunct professor in the department of bioengineering and a member of the National Academy of Medicine. John had spent 28 years at the National Institutes of Health (NIH) where he helped initiate the federal small business innovation research program. He also established new study sections at NIH that put bioengineering and other applied interventions on equal footing in the competition for federal grants. So John knew a thing or two about entrepreneurship, the founding of companies, and the translation of basic discoveries to the marketplace.

Shu Chien arranged in 2000 to send a white paper about this idea to the new leadership at the von Liebig foundation. They were intrigued and proposed a site visit to learn more. After their visit, rather than say, as Whitaker did, "we'll need to run a competition", the von Liebig leaders asked us to provide a detailed proposal. This we did, and in 2001, the von Liebig foundation announced its $10 million gift to the Jacobs School and the department of bioengineering to support the formation and operation of the William J. von Liebig Center of Entrepreneurism and Technology Advancement. John Watson was appointed its inaugural director.

The von Liebig Center has been quite the success. As of now, late 2023, the Center has provided advisory services to over 140 faculty, reviewed 270 technologies, awarded more than $3 million in proof-of-concept grants for around 65 projects, and assisted in forming 26 companies that have raised more than $85 million in private capital.

So here again is a successful story of “seizing the day”, and achieving results that are sustained over time. The School was built with an entrepreneurial spirit and a “can do” culture.

Chapter XI

The State of California Dramatically Expands Engineering in the UC System

The University of California presidency of Dick Atkinson was nothing if not a dynamic and eventful one, captured comprehensively and inspiringly by Patricia Pelfrey in her book, Entrepreneurial President – Richard Atkinson and the University of California 1995 – 2003 (https://www.ucpress.edu/book.php?isbn=9780520270800). Atkinson's presidency was also a dramatic one in the history of the UC, spanning upheavals such as the ending of racial preferences at the University of California; reinventing the economy of California by driving forward university-industry partnerships; expanding dramatically engineering student enrollments throughout the UC system; challenging the role of the Scholastic Aptitude Test (the SAT) in college admissions, thereby changing admissions policies not only at UC but around the country; and overseeing the evolution of UC's role in managing the nation's nuclear weapons laboratories. His was an eventful and highly successful presidency.

The story of the Jacobs School from 1994 to 2002 overlaps Atkinson's time as president, and two initiatives during Atkinson's presidency were directly related to both engineering and reinventing the economy of California. The first initiative, which I discuss in this chapter, came in 1998. It was to expand the undergraduate engineering student body throughout the UC system by fifty percent (50%!) over five years, the biggest change in engineering education ever in the UC system. The second initiative came in 2001 to create four California Institutes of Science and Innovation through a $1.2 billion total investment to drive forward science, engineering, and technology discovery and innovation throughout the state, and promote closer university-industry partnerships. I discuss the California Institutes in the next chapter.

Atkinson's recognition of the importance of engineering and of partnerships between the university and industry go back to his days at Stanford, where he was highly influenced by Stanford's long-serving engineering dean and provost, Fred Terman. He saw up close and personal how a powerful research university that built close ties with industry could change the economy of a region and impact the entire country, bettering the lives of people everywhere.

When Dick was director of the National Science Foundation in the late 1970's, he created the NSF's Directorate of Engineering. In the early 1980's, soon after he became Chancellor of UC San Diego, he met with then Governor Jerry Brown and his chief of staff Gray Davis to propose a state initiative to encourage high-tech industry and university-industry partnerships. That led to the California Commission on Industrial Innovation and its influential 1982 report, "Winning Technologies: A New Industrial Strategy for California and the Nation".

Now, fifteen years later, he worked with Governor Wilson, the Board of Regents, and the State Legislature on a proposal to approve a fifty percent increase in undergraduate engineering students throughout the UC system. The funds were to go to the system's schools of engineering to grow the undergraduate enrollment in engineering and computer science from 16,000 in 1998 to 24,000 in 2003. The budget and program were approved with enthusiasm.

The UC system has an Engineering Deans Council with the purpose of maintaining coordination and cooperation between the engineering schools of the system. As it happened, I was chair of this Council during the engineering expansion initiative. The deans worked with the president's office to support the engineering initiative, spoke with the legislators in our regions to help them understand the power and import of this initiative, and made certain that we were prepared to use these new resources wisely and as legislated.

For the Jacobs School, this initiative could not have come at a more opportune time. During my first four years, and as part of my coming to build the School, a certain number of new faculty positions was allocated to engineering. This permitted the growth over that period. Now, those resources were exhausted and allocations to engineering would be based on a general formula employed by the executive vice chancellor for academic affairs (the title used for the provost position at other universities).

The new state-wide engineering initiative would now provide additional resources in terms of the new faculty positions that we needed to continue to grow. We would be adding undergraduate students to enable the planned growth and adding new faculty to ensure a relatively constant undergraduate student-to-faculty ratio. Covering five years, this would sustain my plan and strategy through my second five-year term as dean.

All this would happen at UC San Diego, but not at the level envisioned by the President. A new executive vice chancellor was appointed in July 1997, Marsha Chandler, formerly dean of arts and sciences at the University of Toronto. In the 1999-2000 academic year, the first year of the implementation of the engineering initiative, she determined that rather than allocate the full number of faculty positions to engineering as planned, she would tax that amount by 30% on the grounds that added engineering students would also be taught by faculty elsewhere on campus. While this might sound reasonable, it was not what was legislated, nor what was expected by the office of the president, nor what occurred on other UC campuses. Nonetheless, since things of this kind are not checked upon within the system, I had little choice. The chancellor Bob Dynes did not feel he could intervene with his new vice chancellor, and going over both their heads to Dick Atkinson was a fool's errand.

With little choice, I accepted Chandler's decision but not without making it clear to both the chancellor and the executive vice chancellor that in my view, this approach of taxing the faculty allocation by 30% was a violation of the express intention of the initiative. And with this began a difficult relationship with the executive vice chancellor that would have consequences three years later, as I discuss in the final chapter.

Nonetheless, engineering did grow both its undergraduate student body fully consistent with the initiative, and we were allocated 70% of the additional faculty positions beyond any normal allocation we would have received. That allowed us to continue our strategy of focused hiring and seizing opportunities vigorously. Two years later, the biggest single opportunity in the UC system for expansion in science, engineering, technology, medicine, and innovation came on to the horizon. The next chapter tells that story.

Chapter XII

The Governor Gray Davis Initiative
The California Institutes for Science and Innovation

Sometime in 1999, I was informed that Richard Lerner, then CEO of The Scripps Research Institute, and John Moores, a regent of the UC system, had suggested to California Governor Gray Davis the establishment of a set of California Institutes for Science and Innovation. They argued that this would be one of the Governor's lasting legacies, and Davis, elected in 1998, understood the economic benefit of such an initiative. After all, he had been Governor Brown's point person for the 1982 initiative built upon the recommendations in the report, "Winning Technologies", that I described earlier.

Crucially, Lerner and Moores recommended to the Governor that these institutes be established at the state's public UC system campuses. The Governor agreed, and a call for proposals went out in December of 2000 to the UC campuses for proposals to be submitted by mid-to-late 2001.

The initiative was uniquely large. The State would provide $100 million for buildings for up to three winning proposals. The funds were to be used to construct a new building or buildings which would serve as the Institute headquarters and provide space for research programs. The Institutes and the successful applicant campuses however needed to pledge to raise matching funds of $200 million. And they had to explain ahead of time just how they would raise these funds. The matching funds could come in many forms such as new endowed chair professorships, graduate student support, infrastructure for laboratories, and the like. A truly bold vision.

I remember in this period, shortly after the initiative was announced, meeting with Richard Lerner and Irwin Jacobs in Irwin's office at Qualcomm. The conversation provided both me and Irwin with insights and background as to what the Governor was looking for, and how the UC would manage the proposal process. Engaging Irwin and Qualcomm would be central to gaining the funding and partnering commitments from industry and from Qualcomm itself.

Bob Dynes was Chancellor, and he led the effort to determine the subject area the campus proposal would be focused upon. Dick Atkinson was still UC President, and the UC President's Office would oversee the receipt and evaluation of the proposals and select three winning proposals.

My view was that the area that would give us the best chance of winning was telecommunications and information technology. San Diego had the leading set of companies in this field and the Jacobs School was now powerful in this broad field. But San Diego is also a Biotech Hub and UC San Diego has a strong medical school. Ultimately, it was Bob Dynes' decision as to which way to go. After much consultation across the campus, around November 2000, Bob chose Telecom and IT.

I recall the dates because in early December of 2000, Bob asked to meet with me. He had a request – Would I lead the campus effort to pull together a strong proposal? And would I ensure that we had broad campus engagement, not just engineering? I agreed. Bob then called a meeting later that December of the campus leadership – the deans and appropriate vice chancellors. At the meeting, he formally informed every one of the field of choice for the proposal and announced that he had asked me to lead the campus-wide effort to create the proposal. All were assured this would be a broad-based effort – and rising tides would raise all boats.

Now, there were a series of new questions. Who would we ask to be the Principal Investigator and Institute Director? How would we engage the campus overall as we sought broad input? Should we submit a proposal alone as UC San Diego, or should we partner with another campus? How would we go about gaining commitments for matching funds so as to provide proposal reviewers with assurances that we had the means to raise the full amount of matching funds required? This was one heck of a big effort! And I had in mind an approach to each of these questions.

The Principal Investigator and Proposed Institute Director

Let me start with who would be Principal Investigator and ultimately Institute Director. Without a strong, visionary leader, any proposal is weak. The answer here was obvious to me (and I'd guess to others).

We had just recruited Larry Smarr, Professor and Director of the University of Illinois' National Center for Supercomputing Applications, to be a Professor in the Department of Computer Science and Engineering. This was without doubt a major catch. Larry was a computational astrophysicists who, in the early to mid 1980's, as described in chapter VII, led the effort to convince the National Science Foundation (NSF) that the country needed a set of national computer centers to serve the nation's science, engineering, and technology academic research enterprise.

Larry led the Illinois center for 15 years. I'd met him on visits to the UC San Diego Supercomputer Center on campus, and we had now succeeded in early 2000 to recruit him. He was looking for a new beginning after serving so long as Director of a large national center. Heading up a new Institute was not high on his priority list.

Nonetheless, in early 2001, I met several times with Larry. He was reluctant until I offered the following: please lead this proposal, you are perfect for it. But, if after two years, you want to step away, I'll enable that. It was an exit chute, and with that, Larry agreed. And once he agreed, the juices really flowed.

Larry suggested it would be a good idea administratively to appoint a Director of the Institute for the UC San Diego campus. We were planning now to partner with UC Irvine, and they would have a campus director. For UC San Diego, I recommended Ramesh Rao, a professor in ECE who was at that point director of the School's Center for Wireless Communications. Ramesh agreed with enthusiasm.

To Partner or Not to Partner?

Second question was whether to partner or go it alone. The answer seemed obvious, partner, because there would only be three winners and by partnering, we could provide a two-for-one answer. And the obvious partner for us was our closest neighbor to the north, UC Irvine. As it happens, the dean of engineering at UCI, Nick Alexopoulos, and I were on the faculty in the 1980's and early 1990's at UCLA. We knew each other fairly well. I also knew Ralph Cicerone, the chancellor of UCI at the time, and a very broad-minded leader. With Bob Dynes, we decided this was the best path to move forward. Bob also knew Ralph well. So the chancellors spoke, and the deans spoke, and then Nick spoke with Bob, and I spoke with Ralph. Not long thereafter, we outlined plans on each side, and we had an agreement.

UC San Diego and UC Irvine would partner; the field had already been determined already by us, but UC Irvine agreed; and we offered a 70-30 split of the state funds should we win. Each would be responsible for raising the 2 to 1 matching funds, so for us $140 million, and for UCI, $60 million. Nick found the leader for the UCI campus, G.P. Li, a fabulous choice as it turned out.

We now had the overall director and principal investigator, and two campus directors who would in turn lead and guide the development of the proposal.

Engaging the UC San Diego Campus to Produce a Campus-Wide Proposal

To engage the campus broadly, I organized a series of meetings with faculty from the various divisions, including medicine. Faculty from engineering, physics, and chemistry in particular attended, but so did faculty from departments in the Divisions of Social Sciences and of Arts and Humanities. This should not be surprising. Afterall, the telecom and IT industry operate under rules, and we had experts in economics and political science, specializing in telecommunications policy and economics, and we had real strength in cognitive science. From the Arts, faculty came who were keen on computer-generated or computer-modified art and computer gaming, and they practiced themselves in these area.

Of course, there were many questions, some about how faculty could best participate and what ideas they had. I remember at least one faculty member asking straightaway – "What's in it for me?". If one person asked, it would be in the mind of others. Yet over time, and certainly after Larry Smarr accepted the directorship as PI, we were able to get strong buy-in from the faculty and broad engagement across the campus.

One anecdote – the arts department was particularly keen and faculty there had new ideas of what they could do. Once the building of 70,000 square feet was completed, the arts faculty ended up with about 10,000 square feet – more than they had in their entire division's buildings.

With the interested faculty identified and with Larry Smarr's overarching vision, a coordinated effort to write the joint proposal proceeded. The institute would be named the California Institute for Telecommunications and Information Technology. We affectionately shortened the name to the nerdy Cal IT^2 .

Engaging Industry and Donors - Matching Funds

Having a plan to raise matching funds of $200 million was no mean trick. We needed to establish that we had a plan that could succeed at raising $140M and UC Irvine had to have its plan to raise $60 million. I'll here only describe our efforts at UC San Diego.

Bob Dynes and I sat down to strategize and develop a plan. The Jacobs School had the resources and ties to industry that made it sensible for me to drive this part of the effort. Bob Dynes would join me in many meetings to ensure we flew the full UC San Diego campus flag. Bob himself led the effort to raise funds on behalf of other parts of campus. But engineering and the Jacobs School would ultimately gain commitments for the lion's share of the matching funds, and that was mainly my job.

Our first call to begin the process of gaining donor commitments was, of course, to Irwin Jacobs at Qualcomm. He agreed that Qualcomm would be supportive and would get back to us as to just what they would do. We also had a body of prospects, in particular all the members of our Center for Wireless Communications and the members of the School's Corporate Affiliates Program.

After discussions with Irwin, he let us know the Qualcomm was prepared to make a lead commitment of $15 million, a bit more than 10% of what we needed to raise. Qualcomm would not only to lead with this pledge, but it would be an incentive for others to commit. Together with Irwin, I arranged a series of meetings with all the companies that we had built a strong relationship with over the past six years. We obtained twenty to twenty-five commitments for new endowed chairs, primarily from industry, to ensure we would continue to recruit the very best faculty and retain strong faculty who might have offers from elsewhere. So that added another $20-25M.

There were also offers of equipment needed, for example, to help outfit a new, large clean room and fab for making semiconductor chips; lasers for the use of lithography; and so on. Combined, all this added up to about $60 million, a very respectable down payment on the $140 million were planning to raise. This was certainly more than was needed to show credibility. What it said was: “We can do this!”

A comment on why we were able to achieve these commitments so early and so willingly. As this story has unfolded, over the previous six years, the School had begun centers such as the CWC and built a strong Corporate Affiliates Program with over 40 member companies. We now had credibility with industry – they needed us as much as we needed them – and they knew that they were working with an endowed School, the Jacobs School, that was blossoming into one of the great schools of engineering in the nation. That excitement and sentiment made all the difference.

The Outcome

In late 2001, the winners were announced by UC President Dick Atkinson, and we did of course win. We learned later that the Cal IT^2 proposal was viewed as the strongest of all proposals submitted. The other winners were UCLA as lead, partnered with UC Santa Barbara in nanotechnology; and UC San Francisco as lead, partnered with UC Santa Cruz and UC Berkeley, focused on Quantitative Biosciences, with the shortened name, QB3. Later, a fourth Institute was added at UC Berkeley, the Center for IT Research in the Interests of Society, or CITRIS.

Today, more than 20 years later, the California Institute for Telecommunications and Information Technology (Cal-IT^2) is still vibrant. It has changed its areas of emphasis, as is appropriate, to remain at the forefront but its core is the same. It has made vital contributions to the internet of things and many other developments over the decades in internet research and telecommunications overall.

For a history of Cal-IT2, see https://en.wikipedia.org/wiki/California_Institute_for_Telecommunications_and_Information_Technology#:~:text=Calit2%20was%20established%20in%202000,and%20citizens%27%20quality%20of%20life.

Chapter XIII

Partnering with Philanthropy to Serve Students

The High-Tech High School Enterprise in San Diego

In the mid to late 1990's, Gary Jacobs, the oldest son of Irwin and Joan Jacobs, was working at Qualcomm when the idea emerged of starting a charter high school to train students in science, technology, engineering, and mathematics, the so-called STEM fields. Gary and Irwin had noticed that students being hired by Qualcomm were often foreign born but educated in the United Sates. Could they do something to educate STEM students entering high school in the San Diego region? They believed they could, and Irwin thought to call the effort High Tech High School.

Gary decided to step away from Qualcomm in 1998 and lead a group of about forty public and private sector partners to discuss the state of education in San Diego. The motivation of the Gary Jacobs' group was to help meet the needs of local companies, particularly San Diego's growing panoply of high tech and biotech companies. The concept for a charter high technology high school became an effort to develop an approach to the education of San Diego high school students in STEM areas.

California had passed in 2006 Proposition 209 which banned affirmative action at public universities in the state. This meant that the University of California was explicitly prohibited from using race, ethnicity, or sex as criteria in public employment, public contracting, and public education. The result was a huge drop in the diversity of the student body entering all UC campuses. The university would have to work to find other ways of addressing the issue of underrepresentation, particularly of Black and Hispanic students. This also meant that primary and secondary schools were going to have to double down on critical efforts to ensure that all students had equitable access to the highest quality educational possibilities. This too was a factor in the creation of High Tech Hi.

Larry Rosenstock is a law graduate of Boston University who had worked at the Harvard Center for Law and Education and served as the Executive Director of the Rindge School of Technical Arts in Cambridge, Massachusetts. He had also been the director of the New Urban High School Project. Larry had moved to San Diego in 1997 to become the president of the Sol Price Charitable Fund.

Gary Jacobs and his partners approached Rosenstock with the idea of High Tech High and suggested that this was where Larry could achieve his biggest dreams. Indeed, this vision proved to be irresistible, and Larry agreed to leave the Price Charities and join the HTH effort as its CEO. He would also be the School's first Principal.

The vision Rosenstock developed with the Gary Jacobs' group was to create a new form of urban education that pulls together what Larry characterized as "combining innovative, hands-on learning projects with a traditional arts curricula targeted at students regardless of the socioeconomic status and background of their parents." In practice, this meant addressing the problem of the misfit between vocational education and the chances of real success for students from disadvantaged backgrounds. One metric of success would ultimately be the percentage of students who graduated from HTH who went on to college.

For me, who believed in and supported serving the entire population of the state, finding a way to work with primary and secondary schools to help address this issue was important. I had experience in this arena, having led the effort in the early to mid 1970's to establish the first Minority Engineering Program at the University of Wisconsin. Now, meeting Larry Rosenstock and helping him with his vision would be a way for the Jacobs School of Engineering to serve students and make a difference.

Larry and I arranged to meet in 1999. He explained that he had the background needed for the liberal arts part of the curriculum but could use help developing the technology and science side. And he wanted hands-on work and projects to be a part of the curriculum. I thought this a splendid idea, having gone to Brooklyn Technical High School where ideas similar to Larry's were part of the curriculum. And it is often the case that "making things" is the best way to understand a subject and to develop an intuition as to why things work as they do. So what Larry wanted resonated with me.

At the Jacobs School of Engineering, I received some years earlier approval to appoint a second person as associate dean, this time for undergraduate affairs.

The School's undergraduate enrollment had shot up to over 2500 engineering majors. Tony Sebald was a professor in the ECE department known to be a particularly good teacher and who had worked with his departments on its undergraduate program. I asked Tony to become Associate Dean for Undergraduate Affairs and he graciously accepted.

We knew well what it would take in the way of a high school education to succeed in engineering at UC San Diego. We had been and were working with the region's community colleges to ensure their programs would be a strong feeder source of transfer students into engineering at UC San Diego. We found that these transfer students were quite successful, and their graduation rate was about the same as the graduation rate of engineering students admitted as freshman. But this community college cadre was more diverse and so they added to the diversity of our undergraduate population. That is one way to address an important social issue. High Tech Hi would be another.

I asked Tony to carve out as much time as needed to work with the Hi Tech Hi team on its curriculum development. The final product proved to meet Larry Rosenstock's vision of a curriculum that combined science and technical subjects with innovative, hands-on learning projects and a traditional arts curricula.

The first HTH opened in 2000 as a small, public charter school with plans to serve about 450 students. Under Larry's leadership and overall vision, the HTH enterprise grew to consist today of a network of sixteen charter schools serving about 6500 students. The constellation of HTH schools includes five elementary schools, five middle schools, and six high schools spread throughout San Diego County.

Gary Jacobs and his wife Jerri-Ann Jacobs provided almost $9 million in building space for three of these HTH schools. In return, the original High Tech High School was renamed the Gary and Jerri-Ann Jacobs High Tech High Charter School. The entire enterprise twenty-three years later is a stunning success by all metrics.

For HTH's History, see
https://en.wikipedia.org/wiki/High_Tech_High_charter_schools

The Jacobs Undergraduate Scholars Program

Attracting the strongest applicants to undergraduate engineering is important, and while I have maintained throughout this story that it is a strong faculty that attracts strong students, the students themselves have more than one choice, especially the very best students. And of course, the Jacobs School competes with other engineering schools for these most talented students.

Around 1999-2000, and after Joan and Irwin Jacobs had endowed the School, I asked them about helping the School compete with the strong private schools and other UC campuses for the very best students. The answer that emerged became the Jacobs Scholars Program for entering undergraduate students. The Jacobs agreed to provide the funds for the program, and Joan Jacobs asked specifically that for the undergraduates, we recognize not only their technical talents but their abilities in other areas such as music and the arts. She had in mind the idea that engineers should be well-rounded people.

The program supports ten entering freshman each year with a Jacobs School Scholarship. The scholarship students are selected based on academic achievement, demonstrated leadership, commitment to community, and innovative potential. The scholarship itself covers the cost of in-state tuition and fees for four years, guarantees housing on campus for all four years, and provides for the ability of the student to change majors within the Jacobs School. All Jacobs Scholars receive a Jacobs School Scholars Medal upon graduation.

The Jacobs Scholars program began in 2000 and over the years has proven its mettle. Together with the Jacobs, we established a tradition of celebrating these Scholars at least once a year and I vividly recall Joan's delight in learning who among the students were the wonderful musicians, who practiced the visual arts, who sang, and so on. Sometimes, the students would perform, especially the musically inclined, and it was always a great treat.

As importantly, each year's cadre added to a total, and each cadre was networked to earlier ones, forming more of an integrated whole. Most importantly, the Scholars program has enabled the School to bring extraordinarily talented students to campus, students who otherwise might have gone elsewhere. They add to the strength of the entire School's undergraduate program.

Today, in 2023, there have been close to 200 Jacobs Scholar alumni. The School has tracked these scholars following their graduation and all indications are that they are having successful careers and have formed a strong and sustained network together. Indeed, some have already begun to give back to their alma mater.

The Jacobs Graduate Student Fellows Program

Graduate students working with faculty are at the heart of the research enterprise at any university. And as with undergraduate education, graduate students have choices as to where to attend grad school. Undergraduates looking to do graduate work towards a Ph.D., and who have stellar records, can perhaps go most anywhere of their choosing. Having an incentive, beyond the excellence of the faculty and the scale and scope of the research enterprise, keeps one competitive with the very best institutions elsewhere.

Irwin Jacobs understood all this. As we were discussing establishing the undergraduate Jacobs Scholars program, I suggested that we also needed a special program so as to compete for the best graduate students in the country.

The Jacobs understood and together we established in 2000 the Jacobs Graduate Fellows program. The fellowship would be awarded through the departments to ten of the most outstanding applicants each year. The stipend would be forty thousand dollars for the year and include another three thousand dollars as a "professional development stipend". This latter stipend could be used, for example, to enable the graduate student to travel to attend a major engineering meeting, perhaps the annual meeting of the society in his or her field of interest. It could also be used for something as simple as the purchase of a laptop.

Furthermore, and this is key, being self-supporting, the graduate student is free to select his or her advisor so as to begin working in a field of the student's interest. This freedom to choose an advisor and choose a problem to work on is golden when it comes to the development of a student's independent interests. The program has proven to be a real success, and in 2019, the annual stipend was raised to fifty thousand dollars a year.

The School has admitted ten Jacobs Fellows per year spread across the School's departments since 2000. Today, twenty odd years later, the cadre of Jacobs Fellows exceeds 200, and over the decades has attracted to the school some of its finest graduate students.

Chapter XIV

Transition and Departure

In 2001, having played a central role in the campus's effort to win the competition for the California Institute for Science and Innovation, having accomplished all that has been described in the telling of this story, having reached the level of about 170 faculty from roughly 90 in 1993, I began to consider when and how to complete my tenure. We were within striking distance of the top 10 in rankings. Indeed, in 2003, the year after I left but reflective of my last year as dean, the School in US News and World Reports was ranked 11. That is a long way up from 44 in 1993, and the fastest rise in rankings of any engineering school in the history of those rankings.

We had a strong academic year 2000-2001 and, in my judgement, we were now amongst the very best engineering schools in the country. Yet I could see that, having driven hard for eight years, a natural resistance to further growth of engineering on campus was at play. In a large enterprise such as a university, even though rising tides do raise all the boats, people tend to view resource availability as a zero-sum game. This is despite the fact that we in engineering had demonstrated time and again that we were not playing a zero-sum game with campus – we were playing a rising-tides, campus-growth game.

My first step was to ask Frieder Seible, the founding chair of the Structural Engineering Department, to become my primary Associate Dean. Frieder was a natural leader and had the intelligence, energy and drive needed should the campus choice be an insider for the next dean. Having Frieder in place meant almost assuredly that he would be appointed interim dean should I step away, and not much momentum would be lost. This occurred. And a year after I left, and after a national search, Frieder was indeed appointed my permanent successor.

I also knew that sustaining greatness over time would necessarily be a multi-dean pull over the coming decades. Sometime after the first of the year, 2002, I decided it was time to leave. In February, I arranged to meet with the chancellor, Bob Dynes, at his faculty office in the Physics Department building. It was Bob's wont to spend Fridays if he could with his research group in that building. I told Bob I had decided the time was right for me to leave and that I would step down June 30, 2002, the end of the academic year.

Bob Dynes had been there from the start: first as chair of the search committee that would recommend me to the chancellor; then as vice chancellor for academic affairs; and after Dick Atkinson left in 1995 to become UC president, Bob succeeded Dick as UC San Diego chancellor. He and I had partnered closely along the way, as I've described, and he understood my reasons for wanting to leave now. We agreed on the plan – I would step down and take a two-year leave of absence without pay beginning July 1, 2002.

Once my stepping down was publicly announced in March 2002, opportunities began to appear. Without going into all that emerged, the opportunity that most excited me was to become a managing director at San Diego's largest venture capital firm, Enterprise Partner Venture Capital (EPVC). While I had spent my entire career in academic life, I did have the experience in the late 1980's/early 1990's of founding a high-tech company and seeing it through to an initial public offering (an IPO) on NASDAQ. It had been backed by venture capital. Now I'd be on the other side of the table with other venture capitalists supporting companies that I and my partners concluded had the potential for a big success. This seemed the most exciting choice. I began at EPVC July 1, 2002.

Looking back, leaving when I did was the right decision. Today the Jacobs School is the largest engineering school in the UC system and is ranked 12th in the country. The School is educating future engineers across the disciplines needed by the state and the nation, and as a research enterprise, the Jacobs School is the largest – and I'd say most productive – in the UC system. The foundations that were laid in the eight and a half years of my tenure, from January 1993 to June 2002, enabled all that followed. Building UC San Diego's Jacobs School of Engineering from a good base to a better place was the trip of a lifetime.

Epilogue

After my departure, my Associate Dean Frieder Seible became my successor and he continued to lead and grow the School. His leadership was all the more impressive because it was accomplished without the same level of central campus support that I had had from 1993 through to about 2000. The School maintained its rankings amongst the top fifteen in the country and in 2013, the year Frieder left, it was ranked thirteen.

With the coming of Pradeep Khosla from Carnegie Mellon University as the new UC San Diego chancellor in 2012, and Al Pisano from UC Berkeley as the third dean of the Jacobs School in 2013, another upward swing began. Khosla had been dean of engineering at CMU and Pisano chair of the Mechanical Engineering Department at Berkeley. Both understood excellence and supported engineering. Now with renewed support from main campus and a strategy for further growth on the part of Pisano, the Jacobs School rose in the rankings to as high as nine.

The list of top ten to fifteen highest-ranked engineering schools has seen very little movement historically. Since 1993 when I accepted to join UC San Diego, the rankings have included the same universities for more the thirty years, except one. The only new entrant into the top fifteen over that thirty-year period is the Jacobs School at UC San Diego. And it has been there now for twenty years.

The strategy, foundations, and culture introduced in the years 1994 to 2002 have sustained and maintained the Jacobs School over the decades. And demonstrating the power of California in the United States, five of the top fifteen engineering schools in the country are in California. They are, in order of their ranking, Stanford, UC Berkeley, Caltech, UC San Diego, and USC.

Permanent excellence is the legacy of my years as the Jacobs School's first dean, something that I readily admit makes me quite proud. As they say where I grew up, "We did good!"

Acknowledgment

I thank Dick Atkinson for suggesting that I write up this story of the transition of engineering from "good to great" at UC San Diego. He as much as anyone envisioned the outcome, brought me to San Diego, and supported me throughout. Once President of the UC beginning in 1995, he did all he could to enhance engineering throughout the University of California system, and the State of California is better off for his efforts.

For me, I begin with a factoid that in my experience, nothing gets done alone. In the journey at UC San Diego, many people helped make a difference. I'll call out here only those who worked closely with me in the Dean's office. They made all the difference: David Miller, the Associate Dean, a first at UC San Diego; Paul Croft and Steve Ross in finance; Denise Hagen, Kelly Briggs, and Mary Ann Stewart in communications and external development; Lindy Nagata, my Chief of Staff; Tony Sebald, who joined later as Associate Dean for Undergraduate Affairs; and Frieder Seible, my last Associate Dean and my successor.

I also owe a real debt to my life partner during those years, Anne Hoger. She was a sounding board for ideas, strategy, and tactics, was always a critical thinker, and she has astounding skills at assessing people and situations. She was a partner indeed.

I have found throughout my career in academia, business, venture capital, and philanthropy that achieving success, and institutional greatness at times, requires the participation of many. The role of the leader is to provide an inspiring vision together with a strategy that can be communicated clearly and with passion, thereby bringing everyone along. In many ways, this has happened again and again – at the University of Wisconsin in the 1970's; at UCLA in the 1980's into the early 1990's; at UC San Diego from 1994 to 2002; and at The Kavli Foundation from 2009 to 2020. To employ a metaphor from travel, the feeling amongst the people needs to be that an exciting journey is beginning, that the train is leaving the station, and that they need to get on board. As the train moves farther and farther down tracks, more and more get on. And then, miraculously, somehow, the actual end point of the journal turns out to be much, much farther down the tracks than anyone thought possible at the start. To all those who "got on that train" at UC San Diego, my undying gratitude.