

Martha Dennis

Interview conducted by

David Caruso, PhD

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SAN DIEGO TECHNOLOGY ARCHIVE



Martha Dennis



Dr. Martha Dennis, a telecommunications technologist, entrepreneur and venture capitalist, was a Venture Partner at Windward Ventures and Windward Ventures 2000. Prior to joining Windward Ventures in 2001, Dr. Dennis served as the President, Chief Executive Officer, and Co-Founder of WaveWare Communications. From 1987 to 1997, she was Co-Founder and Vice President of Engineering of Pacific Communications Sciences, a San Diego based developer of wireless communications equipment. Previous to this from 1976 to 1987 she was at M/ACOM Linkabit where she was AVP of Software Engineering. She serves as Lead Director of Space Micro, Inc., Chairman of Netsapiens Inc., and Board Member of Mundoval (MUNDX). Dr. Dennis chairs the La Jolla Music Society and is past President of the Boards of the Reuben H. Fleet Science Center, the Bishop's School and UCSD Athena; she is also the former Chairman of the San Diego Science and Technology Commission. Dr. Dennis is an Advisory Board Member of EvoNexus and the Dean's Advisory Councils of the UCSD Jacobs School of Engineering, the UCSD Rady School of Management, and the SDSU College of Engineering; she is also an Emerita Trustee of Harvey Mudd College. She has also served on the Boards of the San Diego Foundation, the San Diego Regional Chamber of Commerce, and the San Diego YMCA. In addition she was on the Advisory Board of the Smith College Picker Engineering Program and was a member of the founding Executive Council of the UCSD Center for Wireless Communication. She won the 2003 Pinnacle Award for Technology. Dr. Dennis holds a doctorate in Applied Mathematics (Computer Science) from Harvard University and a B.S. in Mathematics from Smith College.

Source: Martha Dennis



THE SAN DIEGO TECHNOLOGY ARCHIVE

INTERVIEWEE: Martha Dennis
INTERVIEWER: David Caruso, Ph.D.
DATE: March 28, 2014
LOCATION: La Jolla, CA

1 **CARUSO:** Today is the 28th of March, 2014. This is David Caruso, and I'm with
2 Martha Dennis in La Jolla, California. This is an interview as part of the San Diego
3 Technology Archive Oral History Project. Thank you again for agreeing to spend
4 some time with me to talk about the history of this very fascinating area. As I
5 mentioned to you, what I wanted to start with is just get some background
6 information about where you grew up, your education, your interest in either
7 coming to San Diego or staying in San Diego to work, just sort of the early years that
8 will help give us a better sense of where you wanted to go with stuff in life.

9 **DENNIS:** I was born and brought up in New Haven, Connecticut. My father was a
10 faculty member at Yale, so I had a very academic community orientation. I went to
11 college in the days when girls went to girls' schools and boys went to boys' schools. I
12 went to Smith College in Northampton, Massachusetts, following in my mother's
13 footsteps, and I was a math major at Smith College.

14 This was the days of early and large computing facilities. In Western Massachusetts
15 at the time, there was one computer. It was situated at the University of
16 Massachusetts in Amherst. They took all the math majors from Smith on a field trip
17 to visit the computer one day. We were allowed to go into the room only one at a
18 time because the computer was built with vacuum tubes and more than one visitor
19 would have overheated the room. Obviously, things have changed quite a bit.

20 I had summer jobs during my college career that introduced me to more advanced
21 computers. I was very lucky to have these early opportunities. After graduation I
22 went to work as a computer person for an astrophysicist at MIT. After a couple of

23 years I found the field so fascinating that I decided to pursue a doctorate in
24 computer science.

25 At the time, I was not willing to leave Cambridge, which is where I had situated
26 myself. In fact, the only graduate program in Cambridge covering computer science
27 at the time was at Harvard University. It was not yet identified as computer science
28 but was included in a collection of disciplines in the department of Applied
29 Mathematics. I entered this program at Harvard and four years later received a
30 doctorate.

31 **CARUSO:** What I'm curious about is how many – in terms of the graduate program,
32 roughly how many students were in applied math? Two questions. Was applied
33 math only computer science?

34 **DENNIS:** No.

35 **CARUSO:** So how many graduate students in applied math were really there for
36 computer science?

37 **DENNIS:** I would say the majority were computer science, even at that time.

38 **CARUSO:** And the gender breakdown. Was it relatively evenly split?

39 **DENNIS:** We started with three female students and about ten male students. By the
40 time I got my doctorate, one of the other two female students had dropped out for a
41 year; she eventually came back and finished the program. Another joined the
42 program but left after a couple of years. The third one got married, left and never
43 finished. There was one female professor on the faculty who did not get tenure –
44 apparently this was pretty typical at Harvard for female faculty.

45 **CARUSO:** Well it's kind of still typical.

46 **DENNIS:** She was really brilliant. She had been the first woman to get a doctorate in
47 the department. I was the second.

48 **CARUSO:** So what did you want to do with your doctorate? I mean you came from
49 an academic family. Your father was at Yale. Were you thinking, "I want to go and be

50 an academic as well and do research and live in that sort of academic institution”?
51 Did you want to do something else with your degree?

52 **DENNIS:** I am by nature an engineer, and so rather than wanting to teach, I wanted
53 to build things. At the beginning of my time as a graduate student attitudes were
54 changing about the relationship between industry and academia. People in my field
55 didn't have to be “pure” academics and stay divorced from industry as they had in
56 the past. More and more people had their feet in both worlds, both working in
57 industry and teaching at the same time. In fact, the computer industry was
58 advancing so quickly that the only way for the academic world to keep current was
59 to include faculty who actively worked in industry. At the time our program
60 included teaching faculty from IBM and we interacted with the IBM research labs in
61 Yorktown Heights in New York where the personal computer was being developed.
62 We also had faculty from a local company called Bolt, Beranek and Newman, or
63 BBN. Have you heard of them?

64 **CARUSO:** No.

65 **DENNIS:** They developed the equipment that allowed the implementation of the
66 Internet and were at the forefront of the networking that defines the Internet today.
67 In a rapidly advancing engineering discipline like computer science what was being
68 developed in industry had to be shared with the academic world in order to make
69 academic programs relevant. At the time the Harvard program also partnered with
70 various federally funded research organizations like Lincoln Labs, DARPA and
71 MITRE, sharing faculty and cooperating on research. Actually DARPA funded my
72 doctoral research - this was pretty typical.

73 One thing that is very different from today is that the big push for tech transfer from
74 academia didn't exist then. There was a lot of collaboration between academia,
75 industry and government research organizations. My father, who was an academic,
76 always spoke about how in his day one's reputation as an academic was tainted if
77 one collaborated with industry, but by the mid- to late-sixties this attitude was
78 irreversibly changing.

79 **CARUSO:** Just so I have an appropriate sense, what rough time period is this?

80 **DENNIS:** I was in graduate school between 1966 and 1971.

81 **CARUSO:** So you finish up your degree. You're an engineer by nature, not going into
82 an academic life. Where did you want to go and what did you want to do?

83 **DENNIS:** I wanted to either be part of a research institution or work in an
84 engineering-oriented company where meaty problems got solved and imaginative
85 products were produced. I wanted to be part of the problem solving activities. At the
86 time I wasn't so interested in the business side of industry which seemed very
87 inaccessible to me and about which I knew nothing. But that began to change as my
88 years in industry accumulated.

89 **CARUSO:** What were some of the places that you were looking at for a position that
90 were of interest to you?

91 **DENNIS:** Well, just when I finished graduate school, which was 1971, there was a
92 major downturn in the technology industries. I remember an article in the New York
93 Times magazine section just about that time entitled "Down and Out on Route 128,"
94 and that about sums it up. Just when I was ready to burn up the world with my
95 brand new doctorate in hand, engineering work availability declined. It wasn't
96 pretty. I was offered a position to go into academia – at the time universities were
97 desperate for people who could teach computer science. I knew I didn't want to do
98 it, but I went to the interview on a Monday where they handed me a stack of books
99 for the three courses they wanted me to teach starting that Wednesday. I went home
100 and mulled over taking a teaching job, wrung my hands, stared at the stack of books
101 and finally made a firm decision. On Tuesday, I brought the books back and that was
102 that. I really have had very little interest in teaching.

103 **CARUSO:** One quick question – you were in applied math because there was no
104 computer science department. At the end of your degree, were they looking to form
105 an official department? Where were institutions generally?

106 **DENNIS:** This is the story I've heard, I don't know if it's true. The building on
107 Oxford Street in Cambridge in which my classes had been given, Aiken Computation
108 Lab, which proudly displayed a very early mechanical computing machine in its
109 lobby, was replaced by another building funded with a gift to Harvard from by Bill
110 Gates and Steve Ballmer. The name of the new building is the Max Dworkin Building
111 apparent named after each of the donors' mothers' maiden names. Once that
112 building was erected, the department was renamed "Computer Science"

113 **CARUSO:** So not interested in the academic position offer. Where else were you
114 looking for positions?

115 **DENNIS:** So we had moved to San Diego in 1970 where my husband took his first
116 position as a professor at UCSD. The tech industry hadn't really developed. The only
117 alternative to academia for me seemed to be defense work, which was readily
118 available here due to the presence of the Navy and, of course, many San Diego
119 government contracting firms. I had written my doctoral thesis in the computer
120 graphics area. In fact, my first thesis advisor was Ivan Sutherland, who won the
121 Kyoto prize a couple of years ago. He is known as the "father of computer graphics".
122 He left Harvard when I was less than a year into my thesis work and moved to Utah
123 where he became a professor as well as opening up the very first graphics terminal
124 company called Evans and Sutherland. At the time his work was truly
125 groundbreaking.

126 I finished my thesis at Harvard in computer graphics even though he had left and so
127 when I went to look for a job, it was in computer graphics. There was hardly
128 anything available in San Diego. There was little going on at UCSD. I finally found a
129 job working for a government contractor, Computer Sciences Corporation, doing
130 work for the navy at a big navy research lab in San Diego out on Point Loma. They
131 needed somebody to do some rudimentary computer graphics work. Perfect for me.

132 **CARUSO:** How large of a group of people were working on that, or were you the sole
133 person?

134 **DENNIS:** I was working alone – someone trained in computer graphics was a pretty
135 rare entity at that point in time. However, I wasn't very satisfied with my job because
136 my bosses kept telling me I was working too fast. They explained that for the
137 amount of work I was doing they could have had four contractors on the job – but
138 with only me they couldn't collect overhead (i.e. their profit) for more than one
139 contractor. After two uncomfortable years I decided I didn't really belong there.
140 Eventually, I found a job at a commercial company that was doing computer
141 graphics and I found the work very exciting again. The company was Systems,
142 Science, and Software, Inc. or "S-Cubed" for short in Sorrento Valley. I joined a
143 group that was building CAD/CAM systems.

144 **CARUSO:** I've heard of S-Cubed.

145 **DENNIS:** S-Cubed had acquired a CAD/CAM system company. A CAD system (CAD
146 stands for “computer-aided design”) is a computer-based tool that enables people to
147 design the products that come out of 3-D printers today. CAM (which stands for
148 “computer-aided machining”) is similar and is used to generate instructions for
149 factory machines to follow. But, this was in the early days of CAD/CAM when large
150 computers were required to run these design systems and there were no 3-D
151 printers. I was hired to do the computer graphics part of the system but ended up
152 developing a more sophisticated product than S-Cubed had originally bought. I
153 worked on the CAD/CAM product for four years moving to Computervision when
154 the product line was acquired by this Massachusetts firm. Eventually it was clear that
155 that Computervision wanted to close the San Diego office, a story that happens too
156 often when San Diego companies or product lines are acquired by out-of-town
157 entities. And I wasn’t about to leave San Diego because I was happily married (and
158 still am) to a man who has been a professor at UCSD since 1970. He was the reason I
159 moved to San Diego from Cambridge.

160 **CARUSO:** Please continue with your background story.

161 **DENNIS:** The next step in the saga of my early technical career had roots in 1970.
162 When I first came to San Diego, I had six more months of work left to write up my
163 thesis. I met a nice guy named Irwin Jacobs at a political meeting. He was a professor
164 at UCSD at the time and in 1969 he had started a small consulting company called
165 Linkabit but he hadn’t left the university yet. When I met him, he asked me what I
166 was doing and when I told him I was writing my thesis he asked if I would like an
167 office at UCSD so I could be with other students in an academic environment. I was
168 thrilled because I had been sitting at my dining room table, writing my thesis, and it
169 sure was lonely. Writing a thesis is a pretty lonely activity anyway as anyone who has
170 done so will attest.

171 So I took him up on his generous offer, was given a graduate student cubicle at
172 UCSD and got to know some of his students. Shortly after that Irwin left the
173 university. But it’s probably best if you talk to Irwin and hear from him directly
174 about why he decided to leave academia.

175 **CARUSO:** I haven’t talked to Irwin yet.

176 **DENNIS:** One of the issues for him at UCSD was that there was no proper
177 Engineering Department at the time and no Computer Science. There was a lot of
178 politics that Irwin was trying to work through to create an Engineering Department
179 but he wasn't able to establish one at the time. Today, in contrast, UCSD has the
180 largest, most prominent Engineering Department in all of the University of
181 California. And that in part was the result of a huge gift Irwin and his wife eventually
182 gave to UCSD to fund the then renamed Jacobs School of Engineering. So when I
183 decided to part ways with Computervision in 1976, I went to Irwin to talk about
184 working with him at Linkabit which was blossoming rapidly. I assume you've heard
185 of Linkabit

186 **CARUSO:** Yes.

187 **DENNIS:** At first, Irwin didn't think he needed software people. But I think he
188 realized times were changing and technology was rapidly being implemented more
189 and more in software or firmware rather than hardware. He also thought software
190 was something you just do in an ad hoc way in a lab, as you're developing hardware.
191 Eventually, he decided he would take a chance on hiring a software person and he
192 hired me. From an engineering viewpoint, what I found at Linkabit was that it was
193 probably the most exciting industrial environment anyone could dream of, and
194 especially in San Diego. Why? First of all, Irwin hired excellent people. We kept
195 recruiting at MIT since at the time UCSD didn't produce a lot of engineers. I would
196 take three or four recruiting trips a year to MIT. I became very familiar with Building
197 12 at MIT where the recruiting offices are located. We really had a hard court press
198 on to bring people out to San Diego to serve in this burgeoning tech industry.

199 **CARUSO:** So San Diego wasn't on their radar?

200 **DENNIS:** Right.

201 **CARUSO:** Where were they thinking? I'm assuming Silicon Valley.

202 **DENNIS:** Professionally things were richer and more exciting on the east coast;
203 although the weather differential between San Diego and Cambridge was a strong
204 selling point for us. The people we hired were the type that put their work first. We
205 worked hard at getting on their radar for consideration. We gave lectures. We had
206 information sessions. We did all kinds of things. We had the help of their career

207 office, and Irwin had come from MIT so they listened to him. Eventually we built a
208 critical mass of people from MIT. We recruited heavily at a few other places as well:
209 Berkeley, Stanford, Illinois (for strong RF people), etc.

210 Overall we were pretty good at getting talent. I joined Linkabit as employee number
211 161. That was in 1976 when the company was seven years old. And it grew to be about
212 1,100 employees. Another thing that made Linkabit a wonderful environment for
213 engineers was the variety and quality of the projects we worked on. Often we
214 suggested to customers what they might be interested in building next rather than
215 waiting for them to tell us. As a company we were a go-to place for communications
216 projects that were technologically on the cutting edge, specifically, in satellite
217 communications. Cellular existed, but it was not on our radar for most of Linkabit's
218 existence. We had a lot of defense customers, but we made a push to get into
219 commercial work.

220 One of our products was the first programmable satellite modem. Since it was
221 programmable, it could work in multiple modes – a first for satellite modems. We
222 did the first time division multiple access (TDMA) satellite communications
223 systems. What that meant was that multiple sources could share a satellite link. That
224 really expanded the capability of satellite communications.

225 Although we started out doing government work, we were really interested in
226 expanding into the commercial sector. We applied some of the technology we
227 developed under government contracts to the commercial space by building systems
228 of smaller, more portable satellite dishes that were easier to install and therefore more
229 suitable for commercial applications. They no longer required tons of concrete and
230 giant dishes that had been necessary for reliable satellite communications earlier on.
231 This was possible because of technological advances in signal processing,
232 information processing and coding. This was based, in part, on the work of Andy
233 Viterbi, one of the three co-founders of Linkabit, who is one of the world's foremost
234 experts in error correction coding.

235 We built commercial satellite communication systems based on this advance to
236 smaller satellite dishes. Our very first customer was Schlumberger, the oil
237 exploration company; they would go out to remote locations that were potential
238 oil wells and take samples to determine if they should drill at those spots.

239 The samples they took were in the form of a lot of data that needed to be brought
240 back to large computers located in Denver for processing. At the remote sites they
241 would traditionally record the data on magnetic tape, “schlep” the magnetic tapes
242 back to the computers in Denver, and then decide based on the processing results
243 whether or not to go back out to the remote sites to drill. The small dish satellite
244 communications system we developed enabled them instead to send the data via
245 satellite to Denver directly from the remote sites, have the data processed, and
246 decide remotely whether it was worth staying at the remote sites to drill. In addition,
247 we had the very first satellite phone communication on this system alongside the
248 data transmission. Needless to say, this first satellite phone system which used a very
249 low data rate and thus had very poor voice quality. A bonus was also that the guys
250 who were working out in the field got to talk to their families at home – a new
251 benefit.

252 Our second customer for these small dish satellite communications systems was a
253 guy named Sam Walton. He started a little company named Walmart. He was
254 interested in our product because it enabled him to do what they now call “just in
255 time inventory”. When a Walmart customer purchased a box of Tide at the cash
256 register, the data about this transaction would go over the satellite link back to the
257 warehouse in Bentonville, Arkansas, where the next Walmart delivery truck was
258 being loaded up at the warehouse. As a result of the satellite data transfer the right
259 stuff would be loaded onto the truck immediately for restocking the store where the
260 purchase had been made. So using this system gave Sam a huge competitive
261 advantage - the rest is history.

262 **CARUSO:** One thing I’m curious about: you mentioned that you were recruiting
263 individuals for the company. I’m guessing, though, not everyone who got there
264 stayed there permanently. People might have gone on to other positions. So I’m
265 curious to know whether or not there were other viable companies in the San Diego
266 area, or were people leaving completely and going somewhere else in the United
267 States?

268 **DENNIS:** “No” and “No” to both those questions. Linkabit was an “engineer’s
269 engineering company”. It was really the best engineering experience in San Diego.
270 And the only reason people left was to start their own companies, and this was rare.
271 However, there were a few, and among those early “defectors”, if you want to call
272 them that, were the three guys who started ViaSat. Have you heard of ViaSat?

273 **CARUSO:** No.

274 **DENNIS:** ViaSat is the other large publicly held communications engineering
275 company in San Diego besides Qualcomm. Their business is satellite
276 communications; they remained in the satellite communications business whereas,
277 in general, the other descendants of Linkabit did not. But, no, nobody left to go
278 anyplace else. Why would they?

279 Linkabit began to unravel in the early '80s when it was sold to M/A-COM. M/A-
280 COM was a large microwave company from the east coast. I don't think Irwin had
281 anticipated what happens when one sells a company.

282 Linkabit's first large commercial project was for a Satellite Business Systems, a large
283 east coast consortium of IBM, Aetna and Comsat Labs; the project was to combine
284 multiple satellite downlinks to produce a single, much higher data rate satellite
285 channel than had been possible previously.

286 Linkabit also developed Videocipher, a system which scrambled a video stream and
287 encrypted the associated audio for secure national satellite distribution of
288 programming to cable headends (the location in a city from which all the cables
289 run). This system was created to prevent theft of TV programming distributed over
290 satellite. The resultant system became the national standard.

291 In summary, Linkabit had developed three major product lines: Videocipher,
292 commercial satellite communications systems, and communications systems for the
293 government.

294 After Linkabit was sold to M/A-COM there was a bit of a culture clash – not at all
295 unusual. Linkabit, by its nature was very expansive, experimental, willing to take
296 some risks and willing to make investments in new technology. M/A-COM was
297 much more conservative. So the acquisition was the beginning of the end of the
298 original Linkabit.

299 One evening in the beginning of April, 1985, my husband and I went to my office
300 after dinner to copy our tax return (in those days, people didn't have copy machines
301 at home). I was running back and forth to the copy machine as he was sorting
302 papers. As I went down the hall I heard a knock on the outside door. Standing there
303 were Irwin and Joan Jacobs, so I let them in. After greeting them, I went about my

304 business – it wasn't unusual in the early days at Linkabit to see Irwin and Joan come
305 back to the office after dinner.

306 They went upstairs where his office was. About an hour later, I was again running
307 back and forth to the copy machine, I met them coming down the stairs. Irwin was
308 holding a box, so I held the door open for them. I then asked, "What's the box for?"
309 He said, "I'm quitting. You can be the first to read the e-mail that I just wrote to
310 everyone." Eventually, without his leadership the whole place unraveled. And
311 ultimately M/A-COM separated it into three pieces. The Videocipher group was sold
312 to General Instrument, the commercial satellite communications system group was
313 combined with a M/A-COM acquisition on the east coast, and the government
314 systems group was sold to Titan which was eventually sold to L3.

315 **CARUSO:** So a lot of people like to think of the computer sector as one ginormous
316 thing. In 1980, I think the personal computer was the *Time* person of the year around
317 that time. I'm just wondering if the personal computer revolution, at least in the
318 early '80s, had any impact on what Linkabit wanted to do or where it was going, or
319 were you just dealing with completely different things?

320 **DENNIS:** We were really focused on satellite communications. PCs became a tool for
321 us, as was e-mail and a lot of other things that everybody uses now. These
322 conveniences were new then. Did we ever put them into products at Linkabit? No. It
323 was too early. The company computing infrastructure ran on large computers built
324 by the Digital Equipment Corporation. You might remember – these computers were
325 housed in big computer rooms with lots of cooling. However, early on at Linkabit we
326 did design and build our own special computers that were the basis of our satellite
327 modem products. There was nothing off the shelf in those days.

328 Eventually, we did use Intel components (8086's) in our products; these components
329 ultimately became the basis of PCs (think "Intel inside"). Do you know what and
330 8086 is?

331 **CARUSO:** Yes.

332 **DENNIS:** Phew! In the early '80s, we were worked with two kinds of processors. One
333 type was a digital signal processor which is optimally designed to do those
334 operations necessary for extracting a signal from radio transmissions. And the other

335 type was a control processor used to perform all the logic we built into a system. In
336 those days Texas Instrument made a lot of digital signal processing processors on
337 chips and Intel make the chips we used as control processors.

338 **CARUSO:** Now I also know in the early '80s, there begins a bigger influx of biotech
339 companies, biotech startups. I can imagine that maybe not the same types of tools
340 that Linkabit was constructing, but some of the work that they're doing involves
341 information systems and things along those lines. I was wondering if there was any
342 sort of interaction, either formal or informal, interaction among individuals in the
343 biotechs.

344 **DENNIS:** In those days?

345 **CARUSO:** Yes.

346 **DENNIS:** Not really, because informatics and the DNA sequencing and the use of
347 computation in biotech is very recent. What I have been describing was 35 years ago.
348 But things have evolved and biotech has become a huge arena for computational
349 tools.

350 My husband is a professor at the UCSD medical school. He does research in lipids
351 and is very much in the biotech world. He had a friend who was running a biotech
352 company in the '90's who called me up and asked me to come over and talk. They
353 were trying to figure out what they had to do to apply software to drug discovery
354 matrices. He called and ask me to "come for an hour and tell us what do we need to
355 do, what kind of person do we need to hire to add software to our process." During
356 that period most of the biotech efforts were focused on drug development in San
357 Diego. There wasn't much in common with the electronics industry. Today it's
358 totally different.

359 **CARUSO:** I was just curious to know if sometimes the way that industries grow is by
360 bringing in people who you wouldn't normally expect to see there to bring in
361 different perspectives. I was wondering if, in the overall San Diego community, if
362 there was any interaction among these individuals. Or were they really stuck inside
363 their own company? I am curious if any of that was going on.

364 **DENNIS:** I wouldn't say stuck inside, but they didn't see it as an opportunity at that
365 time. It's a different story now.

366 **CARUSO:** So Jacobs shows you his resignation e-mail. What was your response to
367 that?

368 **DENNIS:** Shock. But I think we all knew it was inevitable. There was a lesson there,
369 and that is: when you sell your company, you sell your company. I left Linkabit two
370 years later with four other people to start a new company. Once Irwin resigned that's
371 when people began peeling off. The "Linkabit chart" shows that well.

372 **CARUSO:** Rough timeframe.

373 **DENNIS:** It happened in the next couple of years. First Andy Viterbi left, and then
374 other senior people began leaving.

375 **CARUSO:** What is it that made you want to start your own company? I guess there
376 wasn't still a whole lot available in the San Diego area for you to switch to a different
377 company.

378 **DENNIS:** We came to a point in our careers at which we had a lot of good
379 experience so we thought, "We can start our own company." There were five of us.
380 We had worked together in at Linkabit and we really didn't know what we were
381 going to produce or work on. Those were the days when if you knew a venture
382 capitalist who trusted you, you didn't even have to have a product in mind – just a
383 vague notion. Obviously, for us we were going to be working in the communications
384 field. The name of our company was Pacific Communication Science, Inc., or PCSI.

385 I happened to know a venture capitalist whose wife I had worked with. She and I
386 were the two most senior women at Linkabit. The venture people knew of our
387 reputations at Linkabit through her. In forming our new company we had put
388 together a team that included a variety of disciplines – so we were fundable. We
389 were thinking that we were forming another little Linkabit.

390 One of the issues for us – and I would say this is true in general for the tech industry
391 in San Diego – is that this wonderful tradition of being engineering oriented has a
392 dark side - it often means you're not marketing oriented enough. Coming from
393 Linkabit were used to selling to the government and to other large companies. We
394 were pretty good at that – but we were but totally lacking in knowledge of consumer
395 marketing. This is still a weakness for San Diego tech companies. But it's changing
396 somewhat now that we've entered the Internet age. Our local tech companies had

397 characteristically small marketing departments and very large engineering
398 departments. We pretty much flunked at selling except for B-to-B or B-to-G
399 (Government).

400 This derived directly from our “growing up” in the Linkabit culture. And to some
401 extent, Qualcomm has the same tilt. That’s our local tech culture. Why? Because it
402 all came from Linkabit. But that’s just my opinion - I don’t know if Irwin would
403 agree. So, at PCSI we started by taking whatever came our way while we frenetically
404 chased lots of opportunities.

405 Our first project was a bit unusual: a meteor burst communications system for
406 trucks. You may ask, “What is that?” It’s a communications system that functions
407 really well in August and really poorly in February because the meteor showers are
408 not visible in February and they are abundant in August. It was a cheap way to get
409 low data rate messages to trucks traveling across the country or traversing remote
410 regions. It was a strange first project and it never went any place, but when a
411 company is starting up, they take on whatever work they can find.

412 Eventually, we were approached by IBM and McCaw Cellular. I don’t know if you
413 remember McCaw. They were one of the first cellular companies to develop data to
414 the phone. I know today that doesn’t sound too exciting, but, in those days, phones
415 were analog. You couldn’t send data except for text messages. We built a system to
416 send digital data using the bandwidth that was wasted between tearing down one
417 call and setting up the next one on a cellular frequency. With our system a user
418 could get data from the internet and have it displayed on his analog phone. So in
419 1993, we could request lists of movie listings, movie times and locations on our cell
420 phones, along with sports scores, winning lottery tickets, news headlines. Very, very
421 primitive, but the beginning of data to the phone.

422 AT&T wireless liked our prototypes and put up a system to support this data-to-the-
423 phone scheme. We worked with IBM and put a module into the IBM Think Pad that
424 allowed you to call up real web pages. It took a while to call up a web page, but you
425 could do it. But, simultaneously, digital phone technology was maturing and
426 eventually this rendered our data-to-the-phone solution unnecessary.

427 The other big development our company focused on was a microcellular system for
428 very densely populated venues that allowed many people to talk on their cell phones

429 simultaneously – something that had been a challenge previously. The system was
430 called Personal Handy Phone and it was sold in Japan. The prime example of its use
431 was in the Japan railway station in Tokyo. Have you ever been there?

432 **CARUSO:** No.

433 **DENNIS:** It's so crowded that you can just lift up your feet and the crowd will pack
434 you in and transport you to wherever the crowd is going. Our customers wanted
435 people to be able to use cell phones even in that super-crowded environment. The
436 Personal Handy Phone (or PHP) standard is still used today in China. The chipsets
437 we developed implementing PHP were designed into phones made by twelve
438 different Japanese phone manufacturers.

439 **CARUSO:** In what general timeframe is this occurring?

440 **DENNIS:** That occurred between 1987 and 1997. In 1993 we sold PCSI to Cirrus
441 Logic, a publicly held company headquartered in Northern California. Cirrus was
442 really wonderful as a parent company; we had a very different experience from the
443 M/A-COM Linkabit experience: they encouraged us to continue in our innovative
444 activities and never got in our way.

445 Cirrus made peripheral chips for desktop computer manufacturers which were their
446 major market. They had acquired us because we made chips they wanted to sell. But
447 in 1996 the desktop computer industry hit a wall and so did Cirrus Logic. That
448 Christmas desktop sales were replaced by laptop sales and it devastated Cirrus. They
449 had acquired several companies, PCSI included, and this downturn caused them to
450 divest themselves of all these companies. So PCSI was sold us off in thirds.
451 Eventually each of the PCSI segments disappeared and effectively PCSI was shut
452 down. At that point I started another company.

453 **CARUSO:** You had mentioned that recruiting for Linkabit, you were going to MIT
454 and other places?

455 **DENNIS:** And I continued doing so at PCSI. Then we discovered Harvey Mudd
456 College, which I think is the best undergraduate technical education available in the
457 country - better than MIT. We kept hiring these Harvey Mudd whiz kids. Because of
458 their broad engineering training, their thinking and creativity didn't stop at the edge
459 of a discipline, but went on to other engineering disciplines. Harvey Mudd is a tiny

460 school. It's one of the Claremont Colleges in Claremont, California. We got so
461 involved with them that eventually, I joined their board and learned even more
462 about their outstanding undergraduate program, and that's why I'm such a fan of
463 their educational process.

464 **CARUSO:** So there was still nothing coming out of UCSD that you would be
465 interested in?

466 **DENNIS:** Yes, by that time, there was. UCSD was getting much stronger. Part of the
467 Linkabit and PCSI cultures was that if somebody wanted to go back to school and
468 get a master's degree or even a doctorate, we'd support them as long as they
469 maintained a certain grade point average. Ultimately UCSD opened the Center for
470 Wireless Communications as the wireless industry grew in San Diego. Many new
471 communications companies were starting up which created a growing need for more
472 communications engineers. So UCSD responded by expanding its ability to train
473 them. The chancellor at the time had great perception about where the future
474 opportunities were for UCSD. His name was Dick Atkinson. Do you know who he is?

475 **CARUSO:** I've heard of him.

476 **DENNIS:** He really understood the importance of the engineering sciences and
477 helped get a large gift from Irwin Jacobs resulting in the naming of the Jacobs School
478 of Engineering. Dick is also amazingly entrepreneurial person. And he supported the
479 creation of CONNECT, one of the first programs in existence founded to support
480 entrepreneurship. You've probably heard about Bill Otterson, the man behind
481 CONNECT. He started CONNECT at the UCSD Extension. His intent was that
482 entrepreneurs should be connected to all the people they were going to need as they
483 built their companies - what you might call the entrepreneurial infrastructure into
484 which entrepreneurs must to connect. He had a huge number of networking events.
485 He'd do things like he'd grab me by the back of the neck, take me up to somebody
486 and say, "Martha, you have to meet this person because he is going to fund your
487 company." Then he'd say to the other guy, "George, you have to listen to Martha's
488 pitch because it's really terrific and she needs funding."

489 At a certain point PCSI was having trouble recruiting people because everyone
490 looked upon California as the land of high taxes - which it is. We went to a dinner
491 party one Friday night at which the Ottersons were guests as we were. When I

492 arrived at the party I must have looked like I'd been dragged through a mud pond.
493 Bill said, "What's wrong, Martha?" I said, "We can't seem to recruit anybody." We
494 had had five offers out to people from Florida, and they all declined that afternoon
495 because it was too expensive to live here. The very next Monday morning without
496 hesitation Bill started another new CONNECT program called CONNECT HR at
497 which he got everybody in the tech community together to talk about our local
498 hiring problem and how to solve it.

499 **CARUSO:** What was his drive behind this?

500 **DENNIS:** He thought he was a dead man. He had been diagnosed with melanoma,
501 and was told that he had only a few months to live. He took Interferon, which was a
502 new drug at the time. And he stayed alive for 15 years after his diagnosis. His drive
503 was to do good for the community. His salary was ridiculously low – he was doing it
504 for the joy of changing the landscape for entrepreneurs.

505 **CARUSO:** Do you know what he wanted for the university from that? I mean he is
506 coming out of UCSD. I can see the benefit to those in the community, but what was
507 the -

508 **DENNIS:** Benefit to the university?

509 **CARUSO:** Yes.

510 **DENNIS:** It wasn't clear. I assume what UCSD wanted out of the CONNECT
511 program was a magic path for tech transfer. But I always looked at CONNECT as
512 partly fulfilling the university's mission to serve the public. Bill was interested in
513 connecting the academic side of the university with business talent in the
514 community. One program he created showcased different technologies at the
515 university by presenting advances in a field alongside related commercial advances.

516 One thing became clear from these programs: in general professors at the university
517 are professors – not businessmen. And tech transfer is most successfully
518 accomplished when academics partner with business people to form companies.

519 I want to mention one other thing that changed the landscape for entrepreneurship
520 in San Diego. In the late 90's a series of facilitated sessions organized by the San
521 Diego EDC (Economic Development Corporation) was held and was attended by

522 local tech CEO's. The purpose was to discuss how San Diego could improve its
523 climate to better support tech company growth. At one session, we discussed a
524 common observation: "Not surprisingly, as a result of the fact that the local tech
525 industries derived from the original Linkabit culture, we have an amazing set of
526 engineering talent in this town. But the marketing and management people needed
527 to complete the teams to make highly successful companies here are nowhere to be
528 found." What often happens in San Diego is that anybody who is talented enough to
529 want to rise in marketing or management decides to pursue an MBA. But rather than
530 go to San Diego State or USD to get that MBA, they would leave town to attend a
531 more prestigious MBA program. They would go to Kellogg. They would go to
532 Anderson. They would go to some name brand business school, and in general,
533 wouldn't come back to San Diego after getting a degree. So San Diego would lose
534 this talent. As a result of this line of thinking one significant idea came out of all
535 these sessions: what San Diego needed more than anything was a first rate business
536 school. So a former VC named Bill Stensrud and I approached UCSD to ask if they
537 might considered starting a school of management. It was Dick Atkinson, at that
538 point the President of the statewide University of California, who agreed with us and
539 committed to making it happen. So a new school of management was born on the
540 UCSD campus. It wasn't called the Rady School of Management until we got a
541 wonderfully generous naming gift from Earnest Rady. And because of a very talented
542 founding dean, Bob Sullivan, in ten years, it has become a nationally ranked first rate
543 school - quite unbelievable.

544 **CARUSO:** Very short period of time.

545 **DENNIS:** Yes, that was the missing piece. Now we're beginning to see the results in
546 the community of having such a fine school of management. We're seeing more and
547 more Rady grads who have an advanced technical degree from some very
548 competitive place and a Rady MBA on top of it. Eventually the presence of the Rady
549 School of Management will make a huge difference in how well San Diego does in
550 building strong new businesses here.

551 **CARUSO:** So I have one question, and then I'd like to return to I guess 1997 where -
552 you mentioned the sort of the dynamism of Bill Otterson and his ability to literally
553 bring people together with CONNECT.

554 **DENNIS:** Literally.

555 **CARUSO:** I'm assuming that with his passing, things may have changed with
556 CONNECT. I'm just wondering if from your perspective the organization is still
557 functioning the same way that it used to, or if there have been changes in it that
558 have had an effect on the community in some way.

559 **DENNIS:** Indeed it has changed. There have been three heads of CONNECT since
560 Bill. The first head was asked by the university to change the focus so that it served
561 tech transfer better – this was not particularly successful. The second head separated
562 CONNECT from UCSD to create an independent organization which was not subject
563 to university salary constraints and rules forbidding political activism. As I
564 understand it, Mary Walshok, the head of UCSD Extension allowed the organization
565 to be removed from UCSD because the university really wanted something that did
566 more to support tech transfer. The lead third is interested in restoring the
567 effectiveness of the original CONNECT; he hasn't been in place very long, but he
568 looks like a promising leader for the organization.

569 **CARUSO:** And the university might have wanted a different interest over time.

570 **DENNIS:** Right.

571 **CARUSO:** Especially if Bill is no longer the driving force, things are going to change
572 under other people.

573 **DENNIS:** I always wonder how CONNECT would have evolved if Bill Otterson were
574 still alive and in charge. How would he have responded to the community's creating
575 all these new resources for entrepreneurs? What would he make of today's
576 incubators and accelerators, and programs like Tech Stars, like Y-Combinator, etc.?
577 These support organizations have gotten to be a little industry here. The sense of
578 community that Bill created is special – and when I say community, I mean that
579 compared to Silicon Valley where you don't turn your back on somebody because
580 they will stab you, here you don't turn your back on somebody because they might
581 deliver their oscilloscope for you to use without your even asking. There was a real
582 sense of community that Bill built that I don't know if anyone else could have.

583 **CARUSO:** So there are two things. Well, I'd like to return to 1997 and thereafter, the
584 next company. [Break in recording.] All right, so after just a quick break, as I
585 mentioned, I just want to pick up with hearing a bit more about 1997 and after, and

586 also some of the activities that you've been engaged in recently the past five to ten
587 years within the general tech community in the San Diego area.

588 **DENNIS:** In 1997, along with a guy I had worked with at Linkabit and PCSI, I started
589 another company called WaveWare Communications. Our goal was to enable
590 wireless sync for Palms. Remember the Palm handheld? At that time, the makers of
591 Palms and other personal organizers were very emphatic that they would never
592 combine their devices with phones. Oh, how they believed it! So what we decided to
593 do was use the wireless data-to-the-phone standard that we had developed at PCSI
594 as a wireless data link to enable the synchronization of Palms wirelessly. In a sense
595 via what is now called "the cloud".

596 So it's a concept that has come alive again, but we were doing it with technology that
597 was barely capable of supporting this functionality - now it's a piece of cake. So we
598 started WaveWare, and within seven or eight months, Palm and their co-founders,
599 Jeff Hawkins and Donna Dubinsky, learned about us. Jeff was the guy who had
600 developed the first touch screen technology, i.e. put your finger on a screen and use
601 it to touch, draw or write. Palm had been sold a couple of times and ended being
602 owned by 3Com. So Jeff came down to San Diego to visit our six-person company
603 and offered to buy us - this was a dream come true for us because we hadn't even
604 finish the product yet.

605 Our acquisition was going very smoothly and Jeff was a really great guy. But, within a
606 couple of months Jeff and Donna, who were unhappy with 3Com's ownership,
607 decided to leave Palm to start a rival handheld company called Handspring. 3Com
608 still insisted that they wanted to complete the acquisition of WaveWare. They
609 continued negotiating with us for months. We later learned that in trying to
610 cooperate with 3Com we did a number of things little companies shouldn't do when
611 they're talking to big companies about being acquired. They said to us: "You're not
612 working with Microsoft, are you," (because Microsoft was trying to develop a
613 competing product). We said, "Absolutely not!" - a bad move on our part. They told
614 us to stop raising money - that they would give us a bridge loan instead - which they
615 later decided to "secure" with our intellectual property. And one day, they sent 13
616 people down to pick our brains telling us that the deal was going to close the next
617 day. When the next day came, I received a phone call from them in which they told
618 me they decided to call the deal off - just like that after all those months of
619 negotiating. What became clear several months later is that they had been

620 negotiating with a competitor of ours at the whole time they were negotiating with
621 us. And they put us in a financial position that would enable them to get our
622 intellectual property without paying for it. When this all became clear, I decided to
623 sue them. Nobody in San Diego would take the case because the odds of a little San
624 Diego company prevailing in a suit against a big Silicon Valley company were small.
625 Eventually a friend of mine who was a crack shot litigator put me in touch with an
626 incredible Silicon Valley plaintiff's firm who specialized in David and Goliath cases
627 just like ours. And in 14 months they helped us win the suit against Palm and 3Com.
628 Unfortunately, that was the end of the WaveWare - we never got to do what we
629 wanted with our technology and the whole market for this type of product fell apart
630 in such a way that I really couldn't pick it up and move ahead.

631 For several years I had been working on the side with many younger entrepreneurs
632 several of whom had worked for me. So after the Palm episode I spent more time
633 advising them. I was connecting them with the people they needed to meet and, in
634 general, doing a little "Bill Otterson" here and there. I enjoyed this activity so much
635 that I began talking with a guy who ran a San Diego venture firm - I was attractive to
636 his firm because I had what venture capital people call a large amount of "deal flow".
637 I knew a lot of people. I had been around for a long time, and lots of people were
638 coming to me for advice, connections and funding.

639 And so I became a venture partner at Windward Ventures. I really liked this firm
640 best among all the local firms because they never closed a session with an
641 entrepreneur by saying, "We'll get back to you" and never calling them. They always
642 delivered great advice to whomever pitched to them. They were frank with advice
643 such as "this is a difficulty", "this is a strength", "you should go in this direction", etc.
644 Those one to two hour sessions were always extremely valuable for the entrepreneur
645 even if we didn't fund them because they got honest and sage advice.

646 **CARUSO:** So constructive, not destructive, supportive, not -

647 **DENNIS:** Absolutely. And I know because at WaveWare, we weren't lucky enough to
648 get advice like that. We did raise money. But, as I tell people, I had calluses on my
649 knees from begging and warts on my lips from kissing frogs because I saw so many
650 venture people. Raising money was very difficult. It was harder for female CEO's to
651 raise money than for male CEO's in those years. Even though I had a great track
652 record and a great product, I met with a lot of "no's" from VCs. The money I raised I

653 raised from friendly angels. So I decided to make the venture experience a positive
654 one for others whenever I could – i.e. if you don't get money from me, at least you
655 get something.

656 **CARUSO:** Right.

657 **DENNIS:** And so I did that for several years until the venture world collapse in San
658 Diego. During that time, I became involved with a number of startups. Now I serve
659 on company boards, one publicly held and the rest privately held. I've gotten
660 involved with a variety of other activities supporting entrepreneurship in San Diego.
661 I joined Tech Coast Angels, an angel investing group; the companies that present to
662 Tech Coast Angels now also get constructive feedback as opposed to an unexplained
663 rejection.

664 Years ago I was a founding board member and a Board President for what was once
665 the San Diego telecom industry association. Recently the organization has refocused
666 on supporting entrepreneurship by running a no-cost incubator called EvoNexus –
667 I've been active in this effort by helping to select the companies admitted to the
668 incubator and advising a small number of them. For many years I also ran a program
669 within this same organization that provided frank and valuable advice to companies
670 by arranging small panels of experts to address a company's
671 biggest issues. Panels were made up of people an entrepreneur normally wouldn't
672 have access to were it not for this program. We have received an immense amount of
673 appreciation for this program from entrepreneurs who've participated. I also work
674 with another group called Chairman's Roundtable who aren't necessarily in
675 technology, but in general business. The companies they see come to this
676 organization for guidance by members; usually there is a team of two members who
677 help them through their tough spots.

678 **CARUSO:** I don't want to trivialize it, but in some ways coaching for companies...

679 **DENNIS:** So that's how I spend my time now. I also do a huge amount of not-for-
680 profit work. Currently I'm chair of San Diego's best music presenting organization –
681 La Jolla Music Society. It was founded in 1968, and it is doing some very exciting
682 things including building a 500-seat concert hall in downtown La Jolla. That takes a
683 lot of time, as do the other not-for-profits on whose boards I sit. The good thing
684 about industry people participating in not-for-profits is that someone from the

685 business community can bring a lot of business knowhow to the not-for-profits and
686 be of great benefit to them. I've also been head of High Tech Night at the Opera for
687 16 years; for me it's a way to connect the arts with the tech community which I
688 believe is really good for San Diego.

689 **CARUSO:** Thank you very much for your time.

690 **DENNIS:** Thank you.

END INTERVIEW

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The San Diego Technology Archive (SDTA), an initiative of the UC San Diego Library, documents the history, formation, and evolution of the companies that formed the San Diego region's high-tech cluster, beginning in 1965. The SDTA captures the vision, strategic thinking, and recollections of key technology and business founders, entrepreneurs, academics, venture capitalists, early employees, and service providers, many of whom figured prominently in the development of San Diego's dynamic technology cluster. As these individuals articulate and comment on their contributions, innovations, and entrepreneurial trajectories, a rich living history emerges about the extraordinarily synergistic academic and commercial collaborations that distinguish the San Diego technology community.