

Howard Birndorf

*Interview conducted by
Matthew Shindell, Historian
April 30, 2008*

SAN DIEGO TECHNOLOGY ARCHIVE



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Howard Birndorf



Howard C. Birndorf is the Founder of Nanogen Inc., and served as its Chief Executive Officer from December 2002 to July 2009. Mr. Birndorf Co-founded Nanotronics, Inc. in 1991 and served as its President. He served as President of Nanogen Inc., from January 2000 to September 2000 and as Chief Financial Officer from December 1997 to July 1998 and from September 1993 to October 1997. Mr. Birndorf was a Co-founder and Chairman Emeritus of Ligand Pharmaceuticals Inc., where from January 1988 to November 1991 he was President and Chief Executive Officer. He was also a Co-founder and Executive Vice President of Gen-Probe Inc., Co-founder and Vice President of Corporate Development at Hybritech Inc., Co-founder and Director of IDEC Pharmaceuticals Corporation, and was involved in the formation of Gensia Pharmaceuticals Inc. (now SICOR Inc.). From November 1991 to January 1994, Mr. Birndorf was President of Birndorf Technology Development, an investment and consulting company, and a founding Director of Neurocrine Biosciences Inc. He serves as Chairman of the Board and Director of FasTraQ Inc. He served as Executive Chairman of Nanogen Inc., from 1993 to August 2009. Mr. Birndorf serves on the board of Hartraq. He was a founding Director of Graviton Inc. and a Director of the Cancer Center of the University of California, San Diego. Mr. Birndorf received a B.A. in Biology from Oakland University and an M.S. in Biochemistry from Wayne State University. Mr. Birndorf received an honorary Doctor of Science degree from Oakland University.

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INTERVIEWEE: **Howard Birndorf**

INTERVIEWER: **Matthew Shindell, Historian**

INTERVIEW: **Part 1 of 2**

DATE: **April 30, 2008**

LOCATION: **San Diego, California**

1 **SHINDELL:** Okay. So, this is interview number one with Howard Birndorf. It is April
2 30, 2008. So, I thought we might start by talking about sort of where you come from.
3 Could you tell us where and when you were born?

4 **BIRNDORF:** I was born in Detroit, Michigan in February of 1950, February 21, 1950.

5 **SHINDELL:** Okay. And, what sort of a family, or how would you characterize your
6 family?

7 **BIRNDORF:** I was the oldest of three boys. I have two younger brothers. My father,
8 our family was I would say lower middle class, but solid middle class. We, we lived in
9 an area of Detroit, the northwest side of Detroit, primarily a Jewish neighborhood. I,
10 being first born I was certainly the apple of my mother's eye. She was quite doting
11 over me. I think my parents were good parents. We had a very good childhood. I
12 went to school. Started at kindergarten in a school called Hampton Junior High. It
13 turns out that our family lived sort of on the other side of the tracks. There was a
14 street called Livernois Avenue and the wealthier children that went to the school
15 lived on one side of Livernois. We lived on the other side of Livernois. I didn't really
16 know that at the time but as I grew up I recognized that. We walked to school. I
17 walked to school. It was an all-Jewish classroom. It was a public school, but all Jewish.
18 The kids that I went to kindergarten with were kids that I went all the way through
19 ninth grade with. And, I remember those times as happy times. My brother, one
20 brother was born three years after me and then another brother was born, I think,
21 eight years after me. We lived in, in a small house, in a, on a sort of unique block. It

22 was just a – in Michigan, in Detroit the streets had multiple one, one street would
23 have multiple blocks, but the street I lived on just was one block long. It was called
24 London, and my address was 6464 London. [Laugh] I still remember that. And, one of
25 my mother's closest friends was a neighbor and I grew up, her son was my age so we
26 were friends. I remember some of my childhood friends in that level. It was a fairly
27 ordinary childhood. I think one exception was, when we were out for summer
28 vacation my mother's father owned a farm, a working apple farm in Ann Arbor, that
29 had about 50,000 fruit trees, apples primarily but also cherries, peaches, and plums.
30 And so, every summer we would go up to Ann Arbor and spend the summer on the
31 farm. And, it was my brothers and myself, and my mother would go out there and
32 stay at my grandfather's house. And on the farm was my, her brother's family lived
33 and he had two boys and a girl. And, the two boys, the two oldest boys were also my
34 and my brother's age. So, the four of us spent the summers together on the farm
35 causing trouble, [Laugh] learning how to drive when we were like seven, [Laughter]
36 crashing into things, ice skating on the pond. There were cows, and horses, and so it
37 was fairly idyllic child, that was a real great way to grow up. They had a cider mill
38 there and in the fall they would press cider and sell cider to like the University of
39 Michigan football games, and things like that. So we, we did that throughout our
40 childhood through, through high school, through college. Every summer we spent,
41 and falls, you know, and weekends and things we would work out there. So, I started
42 working when I was quite young, and I was paid. As I grew up I would, as I got older I
43 would start actually working on the farm in the summers and get money for that, and
44 my family was always, my father was a shoe salesman. A shoe representative. He, he
45 had samples and he would go, on Monday he, his territories were Michigan, Ohio,
46 and sometimes Indiana. And, he would leave on a Monday morning many, many
47 weeks and he would come back on Fridays, and during the week he would go and
48 drive to various stores, show them samples, and get orders for the next season.

49 **SHINDELL:** Was he working for any particular shoe factory or company?

50 **BIRNDORF:** Yeah. He worked, well he worked for several while he was alive, but the
51 one he worked for the longest was something called Craddock-Terry Shoe
52 Corporation, from Lynchburg, Virginia, and he was there for many years. And . . .

53 **SHINDELL:** It's interesting, actually, that your father worked in, in the shoe business
54 because sort of the classic example of industrial clusters is shoe factories and shoe

55 manufacturers. So, you've, you've sort of gone into the latest example of the high
56 technology cluster. [Laugh]

57 **BIRNDORF:** Right. So he, yeah, well that, I don't know if there were other shoe
58 factories in Lynchburg, Virginia but I assume there might have been. I don't know. In
59 any event, he was gone a lot, and during the week we just had normal weeks, and the
60 summers we spent on the farm. But he, he didn't make a lot of money and I think
61 that he spent a lot of, he had a lot of stress about money over the years, I believe, in
62 retrospect. So, I think, several focuses of my life when I was younger were to go to
63 college. It was clearly a, an impetus for us. My father's only brother, and they grew up
64 during the Depression, he, the two of them started in college but since my
65 grandfather only had enough money to send one, his older brother ended up going to
66 college, to Wayne State, and became a physician, so he was quite, had much more
67 money than my father. And, I think though that was a, something that was clearly
68 inputted to me early on, the drive to work, to get an education, to strive to make
69 money beyond what my father had done. I saw his struggles. Although, I don't think
70 we ever knew that we didn't have a lot of money. We never wanted for anything. We
71 always had tricycles, and toys, and he did send three of us through – they told us
72 when we were younger that we want, if we went to college they would pay for our
73 undergraduate, and they did. They paid for all three of us. They paid tuition, books,
74 and if we want, and lodging, and if we wanted anything else we had to work. So, I
75 worked on the farm and all through high school, even before high school perhaps, at
76 jobs, summer jobs, after-school jobs. I started working at a very early age and worked
77 continuously since then, and to this day. [Laugh]

78 **SHINDELL:** In an interview that you did with Mark Jones when he was researching
79 for his PhD dissertation, I don't, you probably remember these interviews, you did
80 mention that you had sort of two role models growing up, one being your uncle and
81 the other your father. I don't know, I was hoping maybe you could go into a little bit
82 more depth about the way in which those two influenced you and, you know, what
83 you think you sort of carried forward from, from them?

84 **BIRNDORF:** Well, I think, from my father it was the work ethic. I mean, he did work
85 hard and he was able to juggle his meager earnings to create a world where his kids
86 didn't realize that they were meager.

87 **SHINDELL:** Did he ever attempt any entrepreneurial activity of his own, or did he
88 stick with working for the shoe companies?

89 **BIRNDORF:** Well, he pretty much was risk adverse as I recall. He was the kind of
90 person that would, was very helpful to his friends. I mean, if somebody wanted
91 something he would go out of his way to help them. On the other hand, he was also
92 the kind of person that would go out of his way to find the best price for something.
93 So, he would go and spend an inordinate amount of time shopping for an item, and if
94 he could find it at a better price somewhere else, it would – he could spend hours
95 searching and he would always get, by far, you know, he would find the deals. So, he
96 was very frugal in a way and he, you know, hated to waste money. His father was
97 extremely frugal. My grandfather was much more frugal than he was. But he was
98 frugal, but he had a very strong work ethic, but I think he was always in competition.
99 Most of his friends were wealthier than he was and I think that he was always striving
100 to have what they had, to give us what other kids had, and that kind of thing. I think
101 that stress was very difficult for him and I think it ended up killing him, you know,
102 and he died when he was in his early sixties, mid sixties. And, he had a heart attack, a
103 major heart attack in his fifties. His brother, my uncle, who was the doctor, affected
104 me in a very different way because he was, you know, from a very early age we would
105 go to him for our medical treatment. And, as we grew up and would go to his office or
106 see him, he had a summer home. We would go out to the lake where he had this and
107 spend our weekends many times, and we had lots of family dinners, and every Sunday
108 night the grandparents were over and we had the Jewish holidays together, and all
109 that stuff. But, when I'd go to his office I'd see how his patients idolized him. He was
110 a very good doctor in terms of providing medical care and his patients really
111 appreciated him. I mean, he was like a god to them, and I could sense that even very
112 early on in my life that that education level and his expertise provided him some
113 adoration of his patients. In terms of my father's entrepreneurial activities I don't
114 think he really had many. I do know that when my mother's father died she was left a
115 bit of an inheritance. I don't think it was very much. It was maybe a hundred, or a
116 \$150,000, which today isn't much but back then it was. And, we then moved. We
117 bought a house in the suburbs. I was fifteen and we moved from Detroit proper to a
118 suburb about thirty or forty miles away called North Farmington. And, I do believe he
119 took some of that money and invested in stocks, that he got tips from people, and I
120 don't think he did well. I think he lost a lot of money in the stock market, or a lot of
121 money then, for him, in the stock market. Because, I remember he invested in

122 something called Scotch Liquid Gold. I believe it was some sort of cleaner or product
123 that he heard was going to take off and I do believe it went broke and [Laugh] he lost
124 all his money. But, I don't recall him ever having any real entrepreneurial kinds of
125 things. He liked to fish. He liked to play golf. Those are all the things I remember. I
126 can't remember anything else that he was really passionate about. He was a great dad
127 and he seemed to be a very good husband. My parents seemed to have a very good
128 relationship and they were married for thirty-four years, I believe, before he passed
129 away.

130 **SHINDELL:** Now, maybe we should talk about sort of your education at that point.
131 Was science a big part of your undergrad, or prior to undergrad, your sort of
132 secondary school education, or when would you say you were first exposed to science
133 or technology?

134 **BIRNDORF:** And, I said this before, I don't believe science was a big deal in my, in
135 my high, junior high school, you know, primary school or secondary school. I went to
136 this one school, Hampton Elementary through ninth grade, and that was right when I
137 was fifteen is when we moved. And because, at those days, they had half years. You
138 could start in either September or January. I had started in January, because my
139 birthday was in February. I was to go start, I was in tenth grade when we moved, or I
140 would have been in tenth grade but if I went and took summer school I would start in
141 the new school at eleventh grade. So I went, the summer we moved I stayed in
142 Detroit and went to high school. I had gone to, that's right I'd gone to one semester of
143 high school and then I'd went to summer school. And so in the fall, in September
144 when school started in the new school where we moved I started in eleventh grade.
145 So basically, I got a half a year bump. Because, when I graduated high school I was
146 only seventeen, because of that. But in high school I was, I would say I was more of a
147 class clown type person. I was clowning around. I was not real big into sports. I
148 worked all through high school in a drug store. I had summer jobs, worked on the
149 farm. And then, when I started college I applied to a small school called Oakland
150 University. I really didn't think I could get in. I had, I was a B student in high school
151 and I wasn't sure of could get into U of M and I had convinced myself [dropped pen
152 on desk] even though I probably would have wanted to go there, I convinced myself
153 that I would have preferred a smaller school and I, and I went to a place called
154 Oakland University, which was a, sort of an experimental school. It was started by, it
155 was under the auspices of the State of Michigan but it was started by Matilda Wilson
156 Dodge, on her estate called Meadowbrook, which was out in Rochester, Michigan

157 where she had this three-hundred-room mansion and 1,500 or a couple thousand
158 acres. And she built this school out there and provided the funding for the initial
159 school. When I started there they had one, I think they had had one graduating class,
160 so they were four years old, and it was a very small school. They offered classes with
161 like ten people in them. And, as I was there, the four years I was there, it grew, and
162 it's much bigger now. In fact, they're starting a medical school there I just saw the
163 other day. I started as a political science major.

164 **SHINDELL:** Now, how did you choose political science? What drew you to that?

165 **BIRNDORF:** Nothing.

166 **SHINDELL:** Nothing?

167 **BIRNDORF:** It was, I didn't know what I wanted to do. I wasn't clear on really
168 anything. I started college in September of '67. I graduated high school in, you know,
169 June of '67, and I started college in September of '67, and that was right around the
170 time that things were really starting to change in the country. That was during the
171 Vietnam War. I lived on campus my first year. I lived in the dorms. My first and
172 second year I lived in the dorms. So, in '67 I went in, I was wearing cuffed pants,
173 penny loafers, and a shirt, and in '68 I was wearing work boots, and jeans, and
174 smoked pot for the first time in '68, experimented with some other things. And, '68
175 was really, when things really started getting, there were starting to get anti-war
176 demonstrations on the campus.

177 **SHINDELL:** So, the Oakland campus was a pretty political place in that time?

178 **BIRNDORF:** Well, it was no more political than the other place, but I think it was, it
179 was as political as things were getting then. And, everybody started growing hair. We
180 had hair, I had hair longer than yours, [Laugh] and beards. And, in '69 I went to
181 Woodstock, for example, and we went to other rock festivals. So, things were really,
182 we were right in the middle of the revolution at the time.

183 **SHINDELL:** Uhm-hmm. So, you probably wouldn't have ever, at that point, imagined
184 yourself as one of the founders of San Diego's first biotech companies? [Laugh]

185 **BIRNDORF:** No. No. Not at all. I was, my parents were quite worried about me. They
186 went to a psychiatrist. I had, I was experimenting with various drugs. I was political. I
187 was very immersed in this whole culture. And, I was still going to school. I was still

188 doing, getting decent grades, and in my junior year is when I, I decided to switch to
189 biology. I'm not sure why I did that, thinking back. I think I wanted to see about
190 being a doctor. In fact, I'm sure of that. I wanted to see about perhaps going to
191 medical school. So, I switched majors to biology and the very first, not the very first
192 biology, so the first in my junior year I had to take the initial biology classes, Biology
193 101 and those kinds of things, and I took all of those. It was in my senior year where I
194 really got turned on by science. That was when I took an independent study with a
195 guy named John Cowlshaw, who was really one of the guys who did influence me
196 quite dramatically in my future.

197 **SHINDELL:** Uhm-hmm. Do you know how he would spell his name, by the way?

198 **BIRNDORF:** I have his information.

199 **SHINDELL:** Oh, okay. Great.

200 **BIRNDORF:** C-O-W-L-I-S-H-A-W, I believe.

201 **SHINDELL:** Oh, okay.

202 **BIRNDORF:** But, I can get that for you.

203 **SHINDELL:** And so?

204 **BIRNDORF:** I took an, I took some classes with him and then I ended up taking an
205 independent study, and that study was, he was interested in blue-green algae. And, I
206 did some studies with him, some independent study, doing independent research on
207 blue-green algae and that's when I realized that I was doing things that nobody else
208 had ever done before and that was the, really magical to me. That was something that
209 really intrigued me. The idea of doing research that heretofore had not been ever
210 done.

211 **SHINDELL:** And was this primarily work in a laboratory, or at a research site outside
212 one?

213 **BIRNDORF:** No. This was in the school, in the lab. We used to grow up these algae
214 and then do experiments on them, and then record the results, and I forget the actual
215 thing [Laugh] we were trying to do. But, we did it. Whatever it was we found
216 whatever we were looking for.

217 **SHINDELL:** So, how many people, what was basically the size of the lab and do you
218 remember how it was structured?

219 **BIRNDORF:** Well, it was a one-on-one deal. I mean, it was an independent study, so
220 I reported directly to him, and I would go into his office periodically, sit down with
221 him, and then we would go over things, and then I'd go off and do the experiments
222 we had agreed on and then come back. You know, that kind of thing. And so, the lab
223 was small. I had taken other labs before. I don't think -- I was always sort of intrigued
224 by lab stuff. I liked that. I believe that I was pretty good in the lab. I was sort of
225 technically good.

226 **SHINDELL:** From, just from the start?

227 **BIRNDORF:** Yeah. I mean I, I was able to, I was, things were very exact. Sort of like
228 cooking, or something like that, and I was, somehow I was good at it. I was good at
229 specifically doing things, and timing things, and waiting for things. What I don't
230 think I was good at was the creative side of that, was thinking about the long-term
231 experiments that needed to be done to prove something. I never thought of myself as
232 a particularly good student. I, actually one of the things, when I was already a senior
233 in college and I didn't think I had learned very much and one of the things this guy
234 did was he took the time to sit down with me. And when I, we were, I remember this
235 very clearly. We were looking at exponential components, where you put like 10^3 and
236 if you added them, and I really didn't understand that at the time, even though I had
237 supposedly learned it at least a year before. And, he sat down with me and explained
238 it to me in a way that I understood it, and I really felt that he took the time to teach
239 me something. You know, he really did teach me something. He taught not only
240 things that I should have probably known before, but also he taught me this whole
241 concept of research and what it was, and the idea of it. And, that was, that was sort of
242 interesting. And now, then it was, pretty soon it was time for me to apply to school.
243 So, I applied to, I don't know, five or six medical schools, the University of Michigan,
244 Michigan State. I may have applied to some out-of-state medical schools, I don't
245 remember. I'm sure I did. And, as a backup I applied to Wayne State University
246 Biochemistry Department thinking that, you know, that I liked the science and I liked
247 being a scientist and that would be a nice, perhaps a good route to take. And, it turns
248 out I didn't get into any of the medical schools. I took the MCAT, I didn't do
249 particularly well on them, but I did get into Wayne State University. Not only did I
250 get in but I got in on a scholarship. I told you my parents said they would pay for

251 school, but they said if I wanted to go beyond undergraduate I would have to do it
252 myself, financially. And so, I got this scholarship, which not only paid for books and
253 tuition but also paid, gave me a stipend, and it wasn't much. It was maybe \$50 a week
254 or something, but it was enough. So, at that point . . .

255 **SHINDELL:** This was 1971 when you started at Wayne?

256 **BIRNDORF:** Yeah.

257 **SHINDELL:** Yeah.

258 **BIRNDORF:** So, this was, I graduated in April, or April or May of '71 and I started in
259 September of '71. That's right. And, it was at the brand new medical school. They had
260 just built it. I think they had, I'm not even sure. It might have been the first year of
261 operation that I started there. It was brand-spanking new. And, so that's what I did. I
262 went and started there. How are we doing?

263 **SHINDELL:** Oh, we've been going for about twenty-five minutes. So.

264 **BIRNDORF:** Okay. I started there in September of '71 and started taking the classes,
265 and you know, it was, some of it I liked and some of it I didn't. Organic chemistry I
266 didn't like very much. Some of the . . .

267 **SHINDELL:** That's one of the reasons I dropped premed, actually, originally. [Laugh]

268 **BIRNDORF:** Yeah. Organic chemistry was tough, and there was physics, and you
269 know, there was some of the stuff I didn't like and some of the stuff, the biology,
270 especially molecular biology, there was a new molecular biology teacher named
271 Bagshaw and he ended up becoming my advisor. And, he was working on the brine
272 shrimp, *artemia salina*, which I ended up working on for my masters thesis with him.
273 That was sort of, you know, I went through the first year was pretty much all class
274 work. You had to get an advisor. The second year was much more research, doing
275 your, your work for your masters thesis. At the same time, I was working full-time, I
276 got a job at the Michigan Cancer Foundation, which was an independent cancer lab
277 downtown near the university, and I got to augment my income. I needed money to
278 live on. I got a full-time job as a research assistant.

279 **SHINDELL:** So, you were working in two labs at the same time?

280 **BIRNDORF:** Right. So, what I'd do was, I really liked working at night at the school
281 because there was nobody there, you know. They had limited equipment. Sometimes
282 you had to wait. There were lines, signups for centrifuges or for scintillation counters,
283 and things like that, but at night everything was wide open. So, I would usually work
284 during the day and then go into the lab at night and stay until ten or eleven o'clock at
285 night and do my research.

286 **SHINDELL:** Now, did Bagshaw have a lot of students?

287 **BIRNDORF:** No. He had maybe two or three as, where he was their advisor. He
288 taught classes as well, so he had a class load, but in terms of, of his load in terms of
289 graduate students I think he only two or three.

290 **SHINDELL:** So, you worked pretty closely with him?

291 **BIRNDORF:** Yeah.

292 **SHINDELL:** And, did he have you working in the lab pretty independently? I mean, if
293 you were there at night you were probably not being very supervised?

294 **BIRNDORF:** Yeah. I was very independent. And, we would, same thing, we'd figure
295 out what experiments we were doing and then that may take two or three weeks to
296 do them, and then I'd sit down with him and we'd go through the results.

297 **SHINDELL:** Uhm-hmm. And what were the primary questions you were interested
298 in with the brine shrimp?

299 **BIRNDORF:** We were looking to isolate [polymerases] from brine shrimp, DNA
300 [polymerases] or RNA [polymerases] and we did, and I wrote my thesis on it, which is
301 actually here somewhere, [Moves away from microphone] I think. I think it's here
302 somewhere. Where is that? Is that it? No. Well, it might be here somewhere. It's
303 probably at home. [Laugh] Or is it? Is this it? No.

304 **SHINDELL:** So, when you were working on these with the brine shrimp, was this
305 completely different laboratory procedures now than what you had been using with
306 the algae when you were at Oakland?

307 **BIRNDORF:** Yeah. I mean, this was a much more sophisticated lab, much more,
308 much, you know, a lot more equipment, you know, and same, I was also at the same

time working at the Cancer Foundation, which was even more sophisticated. They were, you know, funded by grants, NIH grants. I was working for Justin McCormick and Veronica Maher, who still run the Carcinogenic Lab at Michigan State University right now. I still get the occasional newsletter from them. [Laugh] They are Jesuit priests, he's a Jesuit priest and she is a sister. They're both PhD scientists, and they've been working as a team for, I don't know, thirty, forty years now.

SHINDELL: Wow. Did you find it difficult at all to go between the two labs to do different things at different labs?

BIRNDORF: No. No, I didn't find it difficult. One was a job and, you know, I went in and I did my work and it was similar, you know. You know, you do, I'd go to Justin and I'd sit down with him and he'd say, "Here's what we're doing," and I'd go do it. And, same, it was sort of similar at graduate school. Although, at graduate school, you know, I had to collate the information for a written paper, which was published, and also the subject of my, my thesis. And then, at some point, I had to orally defend that thesis, which I did. So, that was in '72-'73, and . . .

SHINDELL: It sounds like you had a real knack for work at the bench?

BIRNDORF: Yeah. I did have a pretty good knack for working at the bench, and I, actually started screwing around – one of the first things, first interesting things that I did when I was at the Michigan Cancer Foundation is I thought I had invented something. I had – we were looking at breast milk to see if there was a virus that causes breast cancer, and I, I had, I put together a, an apparatus to do isoelectrofocusing, which moved, moves particles in electric field to their neutral point and focuses them there, and then if they focus there then you can find them. So it's a nice . . .

SHINDELL: Sounds sort of like gel electrophoresis?

BIRNDORF: Yeah. It was like gel electrophoresis, only in a different, a matrix of particles, in a big cylinder. And then I put electrodes on the end and I made this apparatus and we tested it and we were looking to see if we could find a new virus that may cause breast cancer. And, I actually took that, I was using as the particles a product that was made by Bio-Rad, a company that's in Richmond, California, and I actually called them up and a guy came and looked at this. I was thinking that I might be able to sell this through them, this device that used their particles.

341 **SHINDELL:** Did you know anything at that point about patenting or anything
342 involved with sort of thing?

343 **BIRNDORF:** Nothing.

344 **SHINDELL:** No?

345 **BIRNDORF:** Nothing. I called this guy – I can't remember – the guy came out, he
346 took me to dinner. We, he came and he looked at this thing and I think they
347 ultimately decided that they didn't want to do it. But, it was pretty exciting for me. I
348 was thinking this might be a way to make money, duh, duh, duh, duh. At the time I
349 was making, I don't know, \$10-\$12,000 a year at the Cancer Institute, plus a few bucks
350 at the school. And, I'm trying to remember the sequence of events. What happened
351 then was I, I was finishing up my thesis and I was trying to decide whether or not I
352 should continue on to get a PhD. And, I actually started taking extra courses and it
353 was in, it was in – so I went – let's see. I went, I started in September '71, to September
354 '72, to September '73, and I actually continued after September of '73 I, I was basically
355 done and I stayed on at the Cancer Foundation and I was still, I decided to continue
356 to take classes and I started taking classes. I was still working in Bagshaw's lab, and in
357 September '73 my father had a major heart attack. No, September of '74. Sorry.
358 September of '74. September of '71 to two, to three, that's right, to four. September of
359 '74. I actually stayed another year. I was taking classes, I was in my third year, I was
360 working at the Cancer Foundation, and in September of '74 my father had a major
361 heart attack and he almost died. And, he recuperated September, October,
362 November, December. In December of '74 I was driving – I lived about an hour away
363 from downtown Detroit. So, every day I would . . .

364 **SHINDELL:** So, you did an hour commute every day?

365 **BIRNDORF:** Forty-five minutes to an hour commute, depending on the traffic. Some
366 days it was longer. And, in December of '74 I was driving down to the Cancer
367 Foundation. It was in a huge snowstorm. I was on the Lodge Freeway. I was at the
368 Wyoming exit, and I remember going, "Why am I doing this? What am I doing here?
369 This is crazy. I've got to get out of here." And, that week, I don't know what happened
370 but that week I went in and I gave notice at my job and I gave notice at the, I told
371 them at school that I was done, and two weeks later in January of '75 I picked up with,
372 I sold my car, I picked up with my dog, my cousin who wanted to go with me, she was
373 going to California. We got a drive-away car, where they paid us \$300 to drive a car

374 from Detroit to San Jose, her dog, my dog, and her and I got in this car and drove,
375 started driving from Detroit to San Jose in January '75, and I just decided I just
376 couldn't continue doing what I was doing and it was time to leave, and I just did.
377 And, that was sort of the end of Detroit. [Laugh]

378 **SHINDELL:** Yeah. So, you had no idea what you wanted to go do at that point?

379 **BIRNDORF:** I had no idea what I wanted to go do. I knew I wanted to take a break. I
380 basically didn't start work again until the end of '75. I started working at Stanford in
381 December of '75. So, basically took the whole year of '75 off. I was getting
382 unemployment from the Cancer Foundation, unemployment checks of, I think it was
383 \$94 a week, during that year. And, I just, I had a bunch of friends that were involved
384 in this commercial store called Roots. They sold, they're still around. They sell high-
385 end leather goods and shoes. And, they opened a store in Berkeley in San Francisco,
386 and in Palo Alto. And, they were close friends of mine from Michigan. And, I came
387 out and I basically would move around between those three guys and stay with them,
388 and I was, how old was I, I was twenty-four. I turned twenty-five that year, and that,
389 that was what I did. I took the whole year off and then in December I went and,
390 around probably October or November I started looking for a job, and I interviewed
391 at UCSF, Berkeley, and Stanford, and I took a job at Stanford.

392 **SHINDELL:** And you decided at that point to look for a job and not, --

393 **BIRNDORF:** In science.

394 **SHINDELL:** --not a PhD program?

395 **BIRNDORF:** Well, it's funny, because one guy who was working in I think it was
396 sickle cell – I'm not sure I can remember – but one guy offered me a job and a
397 doctorate program at UCSF, and I think I turned it down in favor of the job at
398 Stanford that was in breast cancer, in the Oncology Division with a guy that
399 specialized in breast cancer. And for some reason I was just intrigued by the whole
400 cancer thing.

401 **SHINDELL:** So, it was the problem that chose you to choose?

402 **BIRNDORF:** You know, I don't know.

403 **SHINDELL:** Or, led you to choose?

BIRNDORF: Maybe it was the problem. Maybe it was Stanford. Maybe it was going to Palo Alto, moving to Palo Alto as opposed to San Francisco. I'm not sure but the guy did offer me a program where I could get a PhD as well as work in his lab. It turned out the guy was quite famous. I didn't know this at the time. I think his name was Kahn, or something. And, whatever he was doing he was pretty good at. I found that out later.

SHINDELL: Uhm-hmm. Did it take you a while to get used to life in the Bay Area compared to Michigan? Or, did you sense that there was any sort of difference in the culture there?

BIRNDORF: Well when, in 1970 I took a six-week trip and I, well let's see. Was that in '70 or '72? I took, had taken two trips to California prior to 1975. I did a trip in the summer of '70 with some friends. We drove in a Volkswagen camper [Laugh] from Detroit to Berkeley. And, that was like a two-week trip, and I was just enthralled by California, by the Bay Area. It was just fabulous. And, I had friends out there and I was really, loved it. But, that was just a two-week trip. Then in '72 I took a much longer trip. I took about a six-week trip and I went to Chicago and then to Aspen, and then to California, and then came back and that was about a six-week thing, and I really loved California at that point. And then three years later, roughly, '72, three, four, two and a half years later I ended up wanting to go there for good. Well, Detroit is very different than here. I'm trying to think did it take me to get used to it? It didn't really. I sort of took to it. I don't know, it didn't seem . . .

SHINDELL: Was there anything particular, in particularly different about say the work culture on the West Coast versus the East Coast?

BIRNDORF: Well, I always felt that the work culture on the West Coast was not as diligent as the work culture on the East Coast, for some reason. Maybe it's the weather. Down here it seemed always that the surfing thing that kind of thing. I'm not saying that's absolutely true, [Laugh] but it seemed like that to me at the time. Palo Alto took some getting used to compared to San Francisco. Palo Alto was, you know, it was all very wealthy, all concentrated in a small area, and if you were not wealthy and you were, you know, I was, I don't remember what I was making probably \$12,000, \$1,000 month or something and I rented rooms in different places and shared houses and it was, it was fun years, but it wasn't – and, the stuff at Stanford was pretty interesting. That's how I really got involved. I met Ivor at

437 Stanford. I got involved with hybridoma research at Stanford when it first came to
438 this country. That's, I started doing hybridomas in the lab, you know, physically
439 doing them myself. I became good at doing it. It's one of the reasons Ivor asked me to
440 go, come down here with him was because I knew how to do this stuff.

441 **SHINDELL:** But, how did you learn that particular sort of expertise?

442 **BIRNDORF:** I just, this guy had gone, Hertenberg went to the lab in England, and
443 Millstein's lab, and learned how to do it on his sabbatical. When he came back he
444 taught his, his associate in his lab, this girl that I knew, and she taught me. Basically,
445 that's how, you know . . .

446 **SHINDELL:** So, it went from sort of person to person?

447 **BIRNDORF:** Yeah. It was sort of watching and then doing it yourself, and it was
448 fairly intricate but not impossible, you know. It wasn't that difficult to do. It was, you
449 know, it just took some skill.

450 **SHINDELL:** If I could ask you sort of a vague general question. Do you think that
451 generally that is how you learned bench science, is from other people doing it, and
452 watching them, and having them instruct you or were you able to learn also by
453 reading articles? How do you think that laboratory expertise is passed down?

454 **BIRNDORF:** For me it was absolutely the prior rather than the latter. I don't, you
455 know, it's very difficult to – I mean, you had to do it sometimes. If you wanted to find
456 a technique, for example – back then. It's so different now, because everything is so
457 computerized now. Back then it was all manual. You did all your pipetting, and it was
458 much more manual than it is today. But back then the primary way was somebody to
459 show you how to do something. If you wanted to use a new technique and say use the
460 new machine that you had never used before, somebody would show you how to do
461 that. You had to read about the technique though, initially. Usually it was in a paper
462 that did something that you wanted to do and you, and you'd have to read what they
463 did and figure out how to do it yourself. But, if that required using equipment or
464 doing things that you had never done before you usually searched out somebody who
465 knew how to do it and asked them to show you.

466 **SHINDELL:** So, you would say it's pretty important to be a part of, say, a network of
467 people with different skills and to sort of have people around or available who have
468 that sort of expertise? Like, it would be pretty hard to work in isolation?

469 **BIRNDORF:** Well, it surely saves time.

470 **SHINDELL:** Yeah.

471 **BIRNDORF:** I mean, I'll give you an example of something that I did that was really
472 bizarre. When I was working at the Michigan Cancer Foundation I had to go do a
473 spin in an ultra centrifuge, and I had never used this particular centrifuge before and
474 I got the rotor and I loaded my samples and then I put the tops on and I put it in the
475 centrifuge and started it up and about a minute later there's this [sound effect]
476 [Laugh] and I stopped it. I shut it down and the rotor was cracked. So, everybody
477 said, "Oh, crap. That, you know, it must be metal fatigue or something." So, they got
478 another rotor and then I did, loaded it up, put the tops on, put it in, started it up and
479 about a minute later [sound effect], and I pull it out and they said, "Well, this can't be
480 two rotors in a row." And, it turns out that whoever had showed me how to do it is
481 either I didn't, nobody showed me. We don't really know. [Laugh] But, I put the tops
482 on wrong. I put them on backwards, or, I don't remember. Something like that. And,
483 because they were on wrong it screwed the whole thing up. And, I remember being
484 called down to the director's office and he said, you know, he was really pissed
485 because these things [Laugh] were like ten grand apiece and I think I just screwed
486 them both up. And, I thought I was going to get fired but I didn't, but he just said,
487 "Before you ever do anything again make sure you know what you're doing," or
488 something like that. So. So, I think it's very important for people, especially on
489 equipment and things like that, it's one thing, you know, if it's a technique of adding,
490 of making a buffer for example, it's pretty easy to read about that, measure the things
491 out, make it yourself. But, if a technique, if it's something that requires you using a
492 piece of equipment that you've never used before . . .

493 **SHINDELL:** Then it's particularly . . .

494 **BIRNDORF:** You clearly, particularly important that rather than just go trying to
495 figure it out yourself that it's much easier, it saves time and potentially disasters
496 [Laugh] to get somebody to show you how to do it.

497 **SHINDELL:** Uhm-hmm. So, during this time you're building up your expertise with
498 hybridoma research and also with monoclonals, is that right?

499 **BIRNDORF:** Yeah. Well, they make monoclonals.

500 **SHINDELL:** Oh, right. They're related to each other.

501 **BIRNDORF:** Yeah.

502 **SHINDELL:** And, this is also the time that you met Ivor Royston?

503 **BIRNDORF:** Yeah.

504 **SHINDELL:** And, can you tell me how that collaboration began? He was working in a
505 different lab, is that right?

506 **BIRNDORF:** Yeah. So, I was working in this one lab and we were working on DNA
507 [polymeration] in breast cancer, and then he was, he was, he was a doctor already and
508 he was doing a fellowship in oncology but he wanted to do research as well, and he
509 was working in another lab. A guy named Ron Levy, who we ended up started IDEC
510 with several years later. Well, about ten years later, eight years later, but Ron Levy
511 was involved with lymphoma. So, there was Ivor was in Ron's lab. They were in
512 lymphoma. And, I was in Frank's lab and he was with breast cancer. And, I'm not sure
513 exactly how it happened, but I used to go up to Ron's lab for something – I'm not sure
514 how, I don't remember how it all transpired but I used to hang out there for
515 somehow – I think I might have been dating one of the girls that or seeing. I don't
516 remember. But, somehow I met Ivor and we, we were talking and somehow there was
517 a collaboration. I talked to Frank and they said, you know, "We want to see about
518 doing these monoclonals," and there was a guy named Bertino there who, who was
519 formerly head of the NCI. I can't think of his first name. He was really a good guy and
520 Ivor really looked up to him. So, I was meeting all these people, these very famous
521 people, and being involved with this cutting-edge science that was really exciting.
522 Ivor wanted to, Ivor was more interested in leukemia than lymphoma, so while Ron
523 was concentrating on using monoclonals for lymphoma Ivor wanted to do some stuff
524 for leukemias, and I think he and I cooked up some experiments where we were sort
525 of coming in after hours and doing some stuff. Nobody really cared. I mean, it was all
526 good science and things like that. We used to go down and find patients in the wards
527 and we'd get blood and things so we could get the cells to make the, do the

528 hybridoma studies and things like that. So, you know, it was, it was sort of a
529 collaborative, you know, it's really how good science is done. That's the real way that
530 science gets done, is sort of talking at the water cooler. [Laugh] You know.

531 **SHINDELL:** Sort of informal conversations? Hallway meetings, that sort of deal?

532 **BIRNDORF:** That's exactly what was going on. Exactly what was going on. You'd find
533 out about this hybridoma thing and all of a sudden you think about, "Well, maybe we
534 could do this with that?" And then, well, you got to learn how to do it first, and so we
535 start learning how to do it and then, you know, that's really the way it was. And, you
536 know, I was, what, twenty-five and twenty-six, and Ivor's older than me. I don't know
537 how old, much older. He's probably seven or eight years older than me.

538 **SHINDELL:** Uhm-hmm. So, you two had a pretty friendly relationship in addition to
539 the collaborative relationship?

540 **BIRNDORF:** Yeah. I mean, I used to go over to his house every now and then, you
541 know. We'd have lunch together, occasional dinners. I became friends with his then
542 girlfriend. I introduced him to his now wife. Yeah, we were friends, and but, you
543 know, and he wasn't my boss at that time. We were just friends, but we were
544 collaborating on some science together. Then, when he got his job – his fellowship
545 was up. This was in '77 now, so I'd worked there for about a year and a half. I started
546 there in December of '75. I worked there a year, almost a year and a half, and
547 sometime in the spring of '77 he had gotten a job down here as assistant professor at
548 UCSD and he was going to be given a 200-square-foot lab and some money to, you
549 know, equip the lab, and he needed to hire, hire somebody, and he said, asked me if I
550 wanted to come down here with him and run the lab down here.

551 **SHINDELL:** Let's pause for a second. It's been . . .

552 **BIRNDORF:** Yeah, I've got to use the restroom.

553 **SHINDELL:** It's been about fifty-one minutes now, so you, if this is a good time to
554 wrap up for today. I'm just, you know, don't want you to be late for your lunch.

555 **BIRNDORF:** That's fine.

556 **SHINDELL:** Okay.

557 **BIRNDORF:** Yeah. I do have to get, I just want to do a few things before I leave.

558 **SHINDELL:** Okay. Well then, that's the end of interview one with Howard Birndorf.

INTERVIEWEE: Howard Birndorf
INTERVIEWER: Matthew Shindell, Historian
INTERVIEW: Part 2 of 2
DATE: 8 May 2008
LOCATION: San Diego, California

559 **SHINDELL:** This is interview number two with Howard Birndorf. It is May 9, 2008.
560 The interviewer is Mathew Shindell. One question that I wanted to ask you, you may
561 not have thought at all about the interview that we did before, since we did it, but in
562 case you had I wanted to ask you if anything had occurred to you since then that, you
563 know, the interview, where recalling that sort of stuff had, had sort of brought up for
564 you? If there's anything you feel like you didn't say or . . .

565 **BIRNDORF:** No, actually, I didn't really think about it [Laughter] much, frankly. I
566 haven't . . .

567 **SHINDELL:** I'm sure you're pretty busy.

568 **BIRNDORF:** I've been pretty busy since then yeah. No, I haven't thought of anything
569 else.

570 **SHINDELL:** Okay. Well, fair enough. Then, when we left things last week we were at
571 the point where you had met Ivor Royston at Stanford and you had begun working
572 with monoclonals and you two had, I think, just moved down here to San Diego
573 when we stopped.

574 **BIRNDORF:** I think we were just, that's where we left off. As I mentioned previously,
575 Ivor had gotten a job as an assistant professor at UCSD and at some point he asked
576 me if I wanted to move to San Diego and be his laboratory assistant, his research
577 associate, at his lab. And, I said, "Okay." And, I remember it was in, I took a trip down
578 here sometime like around March of 1977 and found a place to live, a little, the
579 bottom half of an A-Frame up in Leucadia. That was right on, right on the beach
580 road. I wasn't on the cliff side but I was on the other side of the street. And I, I packed
581 up all my things, which weren't much, and I had, I still had my dog that I had come
582 out from Detroit with, Geeks Romo. He was a great dog.

583 **SHINDELL:** What was his name?

584 **BIRNDORF:** Geeks Romo. [Laugh]

585 **SHINDELL:** How did you come up with that?

586 **BIRNDORF:** That was some, it was the name of some, some character in a parody,
587 some comic parody that I had seen when, sometime in college and I just liked that
588 name. [Laugh] And I, I packed up my Chevrolet Vega. It was fort of a real ugly green
589 Vega, light green, and I remember I drove down from Palo Alto to San Diego. It was
590 right around, right before, I think it was the weekend before Fourth of July weekend
591 in 1977. I remember driving down Highway 5 and I still remember the feeling of going
592 through L.A., and getting down past L.A. into Orange County, and then hitting, when
593 I hit the stretch between San Clemente and Oceanside, that stretch of the Army, the
594 Marine base, Camp Pendleton where the highway's right on the ocean and, and you
595 know, there's this ocean smell. And, it was like this outside, it was gloomy. It was in
596 June. I remember pulling into this, into Leucadia. Leucadia back then was a real
597 sleepy little village. It was not nearly what it is now thirty years later. And, I pulled
598 into this little A-Frame and brought my stuff in, and it was really something. It was so
599 different than the Bay Area and Palo Alto. And, I remember that, you know, I didn't, I
600 don't know when I started work but I had some time off, a few weeks anyway, and I
601 was just acclimating myself to the area. I didn't, I knew one person down here, a
602 friend of mine from Michigan and his wife lived here. And, I got my stuff together
603 and started diving down here. I went abalone diving, and stuff, in those days. And
604 then, finally I met Ivor at the, our lab turned out to be in the VA Hospital, not in the
605 university labs, but the university had a deal with the VA Hospital. So, they had joint
606 appointments and things.

607 **SHINDELL:** Uhm-hmm. Before, before you tell me what it was actually like there, did
608 you have any expectations of what you would see when you got there?

609 **BIRNDORF:** No.

610 **SHINDELL:** Did you think this would be a step up from the lab that you'd been
611 working in at Stanford?

612 **BIRNDORF:** I had no idea. But you know, Stanford Medical Center was pretty cool,
613 and it was very modern. It was cramped quarters. Everybody's cramped at Stanford

because of the demand there, obviously, but nonetheless the labs were pretty nice. And, I came down, [Laugh] I remember driving down and getting into the VA, and going up to the fifth floor, which is the top floor. Our lab was half the size of this office. Literally, if you put a wall down the middle, it would be from the doorway to the window, that was it. It was a 200-square-foot lab. It had a bench along one side and that was it. It was an empty room with a bench and, I think, a hood. And, I was pretty amazed at the lack of space and the small area that we had. It had a telephone in it. And, my job was to go and start ordering all the equipment we would need, and chemicals, and whatnot. And I, that's what I did. I sat down and I, and I started doing that and actually during that process I made one, a contact that turned out to be a very good contact and a long lasting contact. What I did was I called all of the laboratory supply houses. At the time there were three. There was VWR, Fisher, and Scientific Products, and I had each one of the reps meet me and I explained to him what I needed, you know, my list of equipment and things, and I had them bid on the best price. And, the guy from Fisher was this really cool guy who, where I became, I'm still friends with to this day. In fact, I spoke to him yesterday. And, he was the one that not only was the nicest guy but gave me the best price, and that turned into a long-term relationship with him and Fisher Scientific. But, so that's how I did it. I got, I got the best price on all the stuff.

SHINDELL: And, do you think that that's something that labs routinely did or was that something that you innovated?

BIRNDORF: I don't know if I innovated it, but what I, I think I did innovate things in a way. Because, what I ended up doing was, I ended up, this long-term relationship with Fisher turned into a buying group, which I ended up getting a number of other labs involved and then over the years became much bigger. Because, as I would start companies I would get Fisher involved very early on to outfit the company and then they got the business, and the more business they got the better prices we got. And, at one point I was one of Fisher's largest customers because I had a huge number of groups buying from them in Southern California.

SHINDELL: And, they were pretty in tune with, with your needs, your lab needs?

BIRNDORF: Well, they, that was what – I made them drive to give me good service and good pricing. And, I don't know if that was unique, but I do know that I think, you know, this was one of the things that I did well. You know, the things that I think

I do well is I had this real sense of urgency back then and also I was very in tune with trying to get things right but get them at good pricing, good deals, that, sort of like my father did, in a sense. I mean, I had some of the genetics, I think. [Laugh] In any event, we set up the lab and we started working. Finally got the lab set up to the point where I could actually do experiments and we started making hybridomas. The area that we were working on, again, was more leukemia as opposed to Stanford, which was lymphoma, and Ivor's interest was more in leukemia. And we, we, you know, the VA was a very good source of getting patients that had these diseases, the ability to get their blood and, and/or other tissues when they had operations, and whatnot, if they had tumors. And, so we had a good source of tissues, and blood, and we, we went to work and we started making these things. And, that was so, that was, you know, mid '77. And then we sort of, I don't know, I don't remember now how long it took but at some point we started to get bigger. I mean we, we, there was more work to do than I could handle and Ivor got more funding. A lot of it had to do with his fund, ability to get funding, obviously. The university I think gave him startup funding but then he had to generate his own grants. So, he was, he was putting in grants. I don't know if he got them. I don't remember now. But, at some point we had to hire more people. So, I think I hired one or two other lab techs. At one point there were three of us. I was in charge of these other two. And, one of the things that was driving me at the time was money. I was making, my salary, I think, was \$1,000 a month. And, I was working overtime and Ivor was able to get me some overtime on top of that. So, I think my, by the time I left there in '78 I was making about \$15,000 year with overtime, but there was a limit to how far I could go with a masters degree and no PhD, in the VA, in the university system. You know, I was a senior research associate, I believe. I don't remember the title, but I was about as far up the pay scale as I could go and I couldn't go much further without going back to school or something. So, I was starting to really question and wonder what I could do to make more money in my life. Whether I should go back to school and finish my doctorate. Whether I should get out of this all together and try to find something else to do. I really didn't know what to do with myself. So, I was, this was a constant source of aggravation.

SHINDELL: And, did you talk to Ivor a lot about that at the time?

BIRNDORF: I did. I talked to Ivor a lot about that and he was quite sympathetic but he was sort of, his hands were tied. He had no, he wasn't going to pay me out of his pocket, and he had no – he tried to get me, through this overtime stuff, more money.

I think he did recognize my value. So, at some point, and again this is, I think if you ask Ivor as well, I don't know who initially – I think it was during one of these conversations that the idea of using monoclonal antibodies as a business came up. And, I don't know if it was my idea, because I was looking for something to do, or whether Ivor suggested it in response to that, but I know that between the two of us this idea sort of germinated, that maybe, that, you know, part of our research involved using commercial antibodies. And back then, the way antibodies were made was they injected animals, usually sheep or goats, and they would then bleed them and isolate the antibodies from their blood and then package them and sell them. And so, each goat had a different antibody. The antibody was different from each animal. It was against the same antigen but it had different properties. Some were stronger, more immunogenic than others. And we, we said to ourselves, "Well, wouldn't it be nice if you could buy an antibody and it was always the same antibody. You never had to . . .," because each time you got a different batch of antibody you had to recalibrate your experiments to, to accommodate for the fact that that antibody was different than the one you had used previously, even if you were doing the same experiment. So, we said, "Gee, wouldn't it be nice if you knew that forever you could always get the same antibody. You'd never have to worry about that aspect. They would be standardized and they would be uniform. They'd always be the same," and you could do that with monoclonals. You could make them in the lab instead of using animals. They would be cheaper, faster, and better. And so, we were mulling this over and we were thinking, "Well, that would be a great, that could be a great idea for a business for using, to sell as research reagents." You know, there were companies that were doing this. This was not in our minds a gigantic business. You know, it wasn't a Fortune 500 business, but it was a nice idea for a business. So, Ivor went and bought a book called, "How to Start Your Own Business," and he read it and then he gave it to me and I read it. And we, in there it talked about a business plan. So, we divvied up. I wrote the section on competition. I went and figured out who the other antibody companies were.

SHINDELL: And was there anyone who was doing anything similar to what you guys were proposing at the time?

BIRNDORF: As far as we knew, no. No. We didn't. This was about, at most, two years. Probably a year and a half to two years after monoclonals had come to the United States, and at most maybe three years since they were invented.

716 **SHINDELL:** And how were people using them primarily?

717 **BIRNDORF:** They were using them in research, and each lab was doing them, their
718 own. Nobody else was making them commercially.

719 **SHINDELL:** Oh, okay.

720 **BIRNDORF:** And, the lab that had invented the process in England, Kohler and
721 Milstein, had not patented the process. For whatever reasons, they had forgotten, or
722 weren't interested. They ended up winning the Nobel Prize for it, but they didn't
723 patent it. So, we knew we could use it. We also – that was a problem though, we
724 didn't have patent protection, but we didn't know that at the time. We didn't know
725 that was a problem. Anyway, so we ended up writing this business plan, which I think
726 is, people have copies of. I think I have a copy of it here. It was like six or seven pages
727 long. And, we weren't quite – the budget was \$178,000 for one year, and that was to
728 buy, to rent a space, buy the equipment, have an employee or two, and start making
729 hybridomas for certain things and start selling them.

730 **SHINDELL:** Uhm-hmm. And, other than the book that Ivor had bought, did you get
731 any advice from sort of – well, were there any real sort of local bio, not biotech, but
732 bio-oriented businesses that you could get advice from?

733 **BIRNDORF:** Back then there was, in San Diego I don't think that – there was
734 something called Cal, Cal Biochem that made reagents, chemicals for biology labs.
735 They were here.

736 **SHINDELL:** So, sort of bio supply companies, maybe, or equipment?

737 **BIRNDORF:** They were a research house, but we didn't go there. I don't remember
738 any other bio-type companies here in San Diego at the time.

739 **SHINDELL:** And, was there anyone else at San Diego who had sort of gone from
740 being a university researcher to starting a company?

741 **BIRNDORF:** Not to my knowledge.

742 **SHINDELL:** Okay.

743 **BIRNDORF:** There may have been, but, and you know the physicists had,
744 throughout World War II and the chemists for many years had been, but the

745 biologists had never done this. So the, you know, you can look back in history, the
746 physicists and chemists had developed nylons, and rayons, and plastics, and the
747 physicists had done their things in atomic energy and in defense contracting and
748 aerospace. Those areas had all been, been big, so they, I think there were people that
749 were pretty savvy in those areas in terms of intellectual property, and funding. But,
750 venture capital was fairly new.

751 **SHINDELL:** Uhm-hmm. Especially in San Diego?

752 **BIRNDORF:** Well, there was none in San Diego. But, I just read an article in the
753 paper the other day about the, they say the guy that really started venture wasn't, was
754 this guy in Boston. God, what was his name? I just read this. There's a new book out
755 about this guy. It just came out. And, he apparently was the first, he was in the
756 computer area. He started a company. Maybe it was DEC, Digital, that turned into
757 DEC Digital or something like that. But, venture capital was very new. There were
758 other biotech companies in California at the time. Genentech had started in '75, and
759 Cetus had started even before that. So, at least those two. Of course, we were aware of
760 Genentech only because of reading about it in the newspapers or wherever, but, and
761 in fact that turned out to be a big, a big deal for us as you'll see in the story, because
762 we ended up going to the venture firm that started Genentech to talk to them and
763 that's who ended up funding the deal, Kleiner Perkins. But, in the meantime we
764 didn't know what to do with this business plan. We didn't talk to anybody because we
765 didn't know who to talk to. And, it was just Ivor and I discussing maybe how we
766 might get this funding. So, one of the things I did was I took a trip and I took this
767 plan and I took it to friends of my parents and friends of friends that I knew. I knew a
768 guy who was a doctor who, in Chicago, who ended up basically giving up his, his
769 medicine and became a commodities trader on the Chicago Mercantile. [Moves away
770 from microphone] And, I had met a number of his friends over the, you know, when I
771 was in college and they were all pretty wealthy people, [Closes cabinet door] at least
772 to my mind. And, I took a trip to Chicago and talked to them about this idea. And, I
773 sat down with them and I explained, tried to explain to them this idea of making,
774 taking these monoclonals and making them commercial. Nobody had a clue what I
775 was talking about. I mean, these guys, this was about as far away – I might have been
776 talking about, you know, in a different language. They really didn't understand it.

777 **SHINDELL:** Could you describe maybe a typical reaction?

778 **BIRNDORF:** A typical reaction was, you know, "You're a great guy. We, you know,
779 we think you, you know, you have the wherewithal to do something, but we just don't
780 understand what this is all about and it's probably better if you could find somebody
781 that, that did." [Laugh] I tried to take it to some friends of my parents. I had this
782 schoolmate whose father was wealthy. I took it to him. Nobody was interested in
783 putting up \$178,000 to fund this business opportunity. And, so quickly I was out of
784 ideas on who to take it to. And, it turns out, and I actually think that I'm the one who
785 thought of this but I don't know for sure, it turns out that the woman that I had
786 introduced Ivor to on the ward, that ended up being his girlfriend, and then his wife,
787 and moved down here with him to, to San Diego from Stanford, named Collette, she
788 had previously dated Brook Byers, who was now a partner at Kleiner Perkins Caufield
789 & Byers. And, they had invested in Genentech. And somehow, this, we knew that, I
790 knew or some, somehow we knew that Collette knew Brook and I suggested to Ivor,
791 or I don't remember, but somehow the idea came up that maybe Collette could call
792 Brook and ask Brook if he would meet with us so we could show him this idea. And,
793 that happened. She called him. Ivor was going to San Francisco for some meeting. I
794 wasn't there. He went and met with Brook, and showed him our idea, and he came
795 back and Brook was interested. So, sometime thereafter Brook and his partner Tom
796 Perkins came down to San Diego and met with us.

797 **SHINDELL:** Sorry. That's the camera.

798 **BIRNDORF:** Oh.

799 **SHINDELL:** You don't mind if I take the picture now do you?

800 **BIRNDORF:** Well, I'd just as soon not have this [Referring to cigarette] in the . . .
801 [Laugh]

802 **SHINDELL:** Okay. Well, I can wait then.

803 **BIRNDORF:** Brook came down with his partner, Tom Perkins, and we talked. We
804 had a meeting and we talked about, they came and looked at the lab, which at that
805 point was two of these two hundred, we had expanded into two or three of these 200-
806 square-foot modules. But, we had hybridomas up and running in the lab. We showed
807 them. And, you know, they were quite interested. And, in fact, what they said was,
808 you know, "We want to do some homework on this." But, I don't remember if it was
809 that first meeting. I don't think it was. I think they came down a second time. They

810 came down a second time and we ended up taking them to the airport. We sat in the
811 bar at Lindbergh Field and that's where they offered to fund us. Not only did they
812 offer to fund us the \$178,000, but they offered to fund \$300,000.

813 **SHINDELL:** Oh wow.

814 **BIRNDORF:** That's the first time I, the first and last time I've ever gotten more
815 money [Laugh] than I asked for.

816 **SHINDELL:** And so, did they expect more for that money?

817 **BIRNDORF:** No. They just said, "Typically people underestimate how much money
818 they need, and so we'll give you more money than you guys thought." The thing that
819 was a negative for me was, Ivor was the MD, Stanford, Johns Hopkins guy. I was the
820 research associate. Ivor got three times more stock than I did, even though our
821 original deal, he and I, had agreed that we would split this fifty-fifty. And, the reason,
822 in fact at some, one point it was even more than fifty-fifty because it was agreed that I
823 would leave the university and go and do this, and Ivor would not leave the
824 university. He did not want to give up his professor, he was an associate professor,
825 assistant or associate professor at the time. He did not want to leave the university.
826 And, even when we started Hybritech he did not leave the university. He was a
827 consultant. He was on the Board of Directors and a consultant. So, he was on the
828 Board of Directors. I was not. He got much more stock than I did. And, I remember
829 arguing with Brook a number of times about that, and they were adamant. I, I was an
830 unproven entity and I was quite upset about that. But, on the other hand, I think I
831 started at \$30,000 a year, so it was double my salary. And so, in the final analysis I
832 believed that, you know, "What could I lose by doing this?"

833 **SHINDELL:** Did it cause any tension in your working relationship with Ivor?

834 **BIRNDORF:** Yeah. We had, we had a number of arguments. I was quite pissed about
835 this. Anyway, between the time they agreed to do it and the time we actually did it
836 was a number of months, because they said they wanted to do due diligence and they
837 wanted to bring in some consultants. They brought in an intellectual property
838 attorney. It was a guy from Lyon & Lyon, which was a, it no longer exists today but it
839 was a big intellectual property firm out of L.A. They brought in a guy named Tom
840 Sparks, who's a corporate attorney from San Francisco. And we, to this day we still
841 have relationships with all these people. And, I remember we had a number of

842 meetings between the time when they agreed to do the deal and the closing, which
843 was in September of – we closed September 18, 1978, this was. Yeah, here it is. Ah.
844 Here's the book.

845 **SHINDELL:** Is that a ledger? It looks that way.

846 **BIRNDORF:** This was the closing documents.

847 **SHINDELL:** Oh, okay.

848 **BIRNDORF:** October 18, 1978 was the closing.

849 **SHINDELL:** That looks like a pretty large document.

850 **BIRNDORF:** These were all of the closing documents of Hybritech. And, yeah, it was
851 300,000 shares of preferred. They got \$1 a share, \$300,000, and 115,000 shares of
852 common, of which I got 30,000 and Ivor got 85,000. So, this was the document. So
853 anyway, between October, between when we agreed to the deal in June and October
854 we had a number of meetings here in San Diego, like at Ivor's house. I remember us
855 sitting around and we were talking about the intellectual property. We were talking
856 about the corporate structure. We were talking about other kinds of applications for
857 monoclonals. They actually broadened out our idea from just research, selling
858 research products to clinical diagnostics, and even beyond that to therapeutics.
859 Although, we started the company primarily for research and clinical diagnostics we
860 did ultimately get into therapeutics as well, over time.

861 **SHINDELL:** And so, a lot of this stuff must have been very new to both you and Ivor?

862 **BIRNDORF:** Exactly.

863 **SHINDELL:** I can imagine . . .

864 **BIRNDORF:** They told us that neither one of us would be the president.

865 **SHINDELL:** Right. But, I can imagine these interactions maybe being, you know, sort
866 of like a clash of two worlds, the business world and then the --

867 **BIRNDORF:** It was exciting as hell.

868 **SHINDELL:** -- sort of the lab world? Yeah.

BIRNDORF: It was so exciting for me to be exposed to this stuff. And Brook Byers, who was a young guy, he's like, he's like five years older than me, so 58, he's 63, back then I was twenty-eight, so he was thirty-three. He was thirty-three years old. He had been apprentice venture capitalist at Asset Management and then he moved over to Kleiner like the year, right when he met us. This was his first deal. And, he was an amazing guy because he allowed me the freedom to do things I had never done before. He sort of – I don't know if it was trust or just the way he worked, but even though they all agreed that Ivor and I both had no experience in this area and that Ivor was the name guy and got more stock, I was the guy that was actually going to be running the thing, at least initially, and Brook really did – not only did, was I exposed now to all these new things but I was also allowed to participate and actually do things that I'd never done before. And so, that was really exciting and I was very, very energized, intellectually stimulated, everything. It was just great. It was one of the best times of my life.

SHINDELL: Did you or Ivor put up any fight over the idea that neither of you would be president of the company?

BIRNDORF: No. Because, I think we both realized that they were right. And, you know, they kept, they impressed us with this point that, you know, in order for this to be very successful you needed to bring in the right people as well as money, and really make this into something that might be beyond what we had visualized or thought of. So, but it takes time to find a president and it turned out that I was actually acting, or Brook was the acting president and chairman of the company and I was the vice president, but I was the one who was here onsite. He was in San Francisco. So, I was actually running the place for the first six months. Ivor was here too, but he was at the university still. So.

SHINDELL: So, how did you set things up initially, after you closed?

BIRNDORF: Well, it was the same, yeah, so that – so, we ended up closing. The famous story about me having this \$300,000 check, that I flew back to San Diego and was driving home in that green Chevy Vega and ran out of gas, and was freaking out because I had this check [Laugh] in my briefcase. And, I remember my last day at work was like a Friday, and on Monday I started, we went and found a lab to rent at the, it was, it's now the Burnham Institute but it was the, back then it was the Torrey Pines – what was it called? The Torrey Pines – uhm. No, the La Jolla, La Jolla Cancer.

902 And so I, it was the same thing. I had this big, this lab with a hood and nothing in it,
903 some benches, with an attached little office with a desk and a chair and a phone, and
904 that was it. And, I did the same thing. I went and brought in Fisher, ordered all the
905 equipment, got everything, you know.

906 **SHINDELL:** Were you treated any differently by Fischer now that you were starting a
907 lab and not just, you know, in a university lab?

908 **BIRNDORF:** Yeah. I mean, now I had more money. I don't know if I was treated
909 differently. I knew this guy. We were friends. So, you know, it was great. I was able to
910 use the contacts, get things up and running quickly, and you know that's part of a
911 startup is getting things done fast. You've got to get going and I was able to do that
912 very quickly. We started interviewing employees and hiring, you know. I didn't, you
913 know, I interviewed some. We brought in -- Ivor would interview them. I'd interview
914 them. Brook might come down for the right person. We hired a guy named Gary
915 David, who was quite instrumental in the intellectual property development in the
916 future. At the same time, they were looking for a president and they ended up finding
917 this guy named Ted Greene, who was contemplating starting up a competitive
918 company and they talked him into not doing that and coming and joining Hybritech,
919 and he, we started in October and he came in May or June of the following year. And,
920 you know, that was sort of tough for me. I was sort of the main honcho and then now
921 there's this guy over me. Quite frankly, Ted Greene and I never saw eye to eye over
922 the years. It was a somewhat adversarial relationship.

923 **SHINDELL:** Oh? But, did he give you enough sort of free reign to do the things you
924 needed to do?

925 **BIRNDORF:** No. Not as much as Brook had. And, I wasn't on the Board of Directors.
926 Ivor was. So, but I ended up, you know, at first I was in charge of everything. Then
927 Ted came on. Then we started hiring people. We hired a guy, head of Research. I had
928 been running the Research because I knew how to do hybridomas. And then we hired
929 people that knew how to do that and I was overseeing them. Ivor was too. And then,
930 we hired Tom Adams, so that was taken out of my purview, and I was running
931 Facilities and Operations, and we hired a guy to do that. So, that was taken. [Laugh]
932 And, Marketing, I remember the first labels I did for our first product, which was a
933 research monoclonal for hepatitis, I spelled "hepatitis" wrong. [Laughter] And, we
934 had these labels printed with "hepatitis surface antigen" but "hepatitis" was spelled

wrong. Anyway, as we brought on more and more people my, my area kept shrinking, you know, what I was in charge of and it ended up, finally, after probably at least a year or maybe longer I ended up in what was Corporate Development. And, I actually seemed to, I enjoyed that and did pretty well at that. That was going out and finding new monoclonals that we could license in, going to universities finding stuff, technology or products that we could license, doing deals with the Japanese or other companies and that kind of thing. So, I was involved in that kind of stuff and that was, you know, '79, '80, '81, '82, '83. So, I was there about five years. And then, in '84 is when we, Tom Adams, the head of Research and I found this new technology and we went and left Hybritech and started Gen-Probe. So that, that was – but Hybritech turned out to be something that's never happened – Hybritech is really an amazing story and there's been now books written about it. And, we were just honored a few weeks ago here locally. There was nothing like Hybritech ever, that I've ever seen. It turned out to be a magical place.

SHINDELL: What was unique about it? What made it unique?

BIRNDORF: The people. It seems like many of the people that came there were natural entrepreneurs. And, a number of the people that were there went off and started more companies. Hybritech was just a breeding ground for entrepreneurialism, and it turned out to be amazing.

SHINDELL: Do you think that was because . . .

BIRNDORF: The climate of the company was just a magical climate. For example, on Fridays we had these TGs, you know, Thank God It's Friday. In the afternoon we'd quit at three o'clock or something and they'd have beer and, you know, hors d'oeuvres, and everybody would get together and it, it, you know, some of these at some companies, you know, some people, a few people show up for those things. They'd rather go home at three o'clock. At Hybritech, every employee came to this. It was just, it was the sort of the highlight of the week where everybody got together and was talking about business and talking about what they were doing. It was, it was just a very unique company culture. And, you know, Ted Greene, as much as he and I disagreed on certain things we also, he also somehow encouraged this and it really became a big deal. And, over the five years I was there Hybritech was truly one of the most unique experiences of my life and I think many others would say the same thing, in terms of just everybody had a common goal of success. Everybody in the

968 whole company, from the lowliest dishwasher to the CEO was hard-charging, trying
969 to get this thing going, and pushing every day to get stuff done, and it just was a
970 great, great experience.

971 **SHINDELL:** And, have you had anything close to that experience in the companies
972 that you've gone on to found?

973 **BIRNDORF:** None of them have ever hit that level of energy since then. Some have
974 come close, but none of them were ever like that.

975 **SHINDELL:** Do you think that's because when, when you were at Hybritech you and
976 the others there sort of had a feeling that you were doing something new?

977 **BIRNDORF:** Yeah. I think part of it was we were blazing the new biotech industry in
978 a way. And, you know, while we were branched out we were in therapeutics, we were
979 in a little bit research, clinical diagnostics for sure, and then we got into the
980 therapeutic side, but we were blazing the trail. We were a new company. We were
981 doing new things. We were, you know, during that five years I was there, there was a
982 huge growth in biotech throughout the country. So, there were a number of
983 competitors that were set up to Hybritech. Senacor, Monoclonal Antibodies Inc, a
984 number of others. Some of them we fought with. Some of them we didn't. But, it was
985 an amazing time in America for that. That was really the birth of biotech in this
986 country. Hybritech was one of the first, you know, within the first at least ten.

987 **SHINDELL:** Uhm-hmm. And what about locally here in San Diego? Did you perceive
988 the sort of local landscape changing?

989 **BIRNDORF:** Absolutely. What happened was, as Hybritech grew and we had
990 different needs, like space, like supplies, like architecture, like legal, like intellectual
991 property, and it grew bigger and bigger, and we needed more and more, and the
992 network of those kinds of people started to get interested – you know, when we,
993 when we wanted more space to build a lab, even back then, it was, you know, maybe
994 seventy, eighty dollars a square foot. Compared to office space, which was probably
995 ten dollars a square foot. So, there were very few landlords that were interested in
996 providing the tenant improvements for lab space. They'd never done it before. They
997 had no idea if they could re-lease it if we left. It was hugely expensive compared to
998 what they were used to, and they just weren't interested in providing that. And so, it
999 was up to us to figure out how to get that stuff done, and we either had to convince a

landlord that it was in his best interests or we had to do it ourselves. So, I mean all of, there were a lot of problems associated back then with, with convincing people that this was real and that this was going to stay. Especially when we, you know, we weren't profitable. We were a startup. And, we had to, we were venture-backed. In those days, there were, you know, venture capital was relatively new. So, it posed all kinds of hurdles that today don't exist. And so, you know, solving those problems was also gratifying, and developing that network in San Diego. We developed, you know, things like Biocom. Back then it was called something else, and you know things started springing up, trade associations, and you know, this is all over the years. But, the CONNECT Program. That was, you know, turned out to be a, this guy Bill Otterson was an amazing guy. He just, there was nothing like that around the country and he, he was, it was because of him as an individual that that thing was so successful.

SHINDELL: Tell me about him.

BIRNDORF: He just had this uncanny ability to look at industry and university and see collaborations, and see how things could fit, and encourage those things. He was just, with no selfishness on his part, you know. Just, with just the total commitment to trying to make those things work and to see how valuable those kinds of things could be over time. He had this foresight and insight into that process that nobody I've ever seen had. And so, he was incredible. Former venture-backed company guy. I mean, he knew, he knew all the players. He knew the venture guys. He knew the entrepreneur side. He, so he was uniquely qualified.

SHINDELL: Uhm-hmm. So, he was able to put people together?

BIRNDORF: Absolutely. His forte was networking. I mean, he got people to network and to see opportunities that they probably would have never thought of. That was an amazing quality of his.

SHINDELL: In your own case, what, what would you say were, you know, the main things that he did for you?

BIRNDORF: He was, he was just such an ally. He was always there behind the scenes encouraging collaborations, cooperations, licensing, all kinds of things. He was just such an advocate. He was just a truly amazing individual.

1031 **SHINDELL:** And, who else would you say were the primary movers at that time, like
1032 in the '70s and '80s?

1033 **BIRNDORF:** Well, I'll tell you one thing that, that was interesting. When I, when we
1034 started Gen-Probe in '84 I found this old lab that was a commercial lab that had gone
1035 out of business on the far, what way is that, eastern side of San Diego, over by
1036 Highway 15. And we, it was like 8,000 feet and we rented that initially as our startup
1037 space. But, it was far away and most people wanted to be over here by the university,
1038 by Scripps, by Salk. But, because there was very little lab space you didn't have, we
1039 didn't have much choice. So, I had bought a house and the house I bought the
1040 woman . . .

1041 **SHINDELL:** This is a new house?

1042 **BIRNDORF:** Yeah, I bought a new – after . . .

1043 **SHINDELL:** After Leucadia?

1044 **BIRNDORF:** After Leucadia. I lived there for six years. And, when I started Gen-
1045 Probe I went out and I found this house, and the people were getting divorced and I
1046 bought it, and the woman's father was a guy named Malin Burnham, who owned
1047 Burnham Realty & Insurance, and they're one of the founding fathers of San Diego,
1048 one of the founding families of San Diego. They'd been involved in San Diego politics,
1049 and the movers and shakers for, you know, years, and years, and years. And, it
1050 occurred to me that it might make sense to get a guy like that involved in biotech.
1051 And, I called him up. I called, through his daughter I called him up one day and I
1052 went and had lunch with him and pitched him to be on our board, the Board of
1053 Directors at Gen-Probe. And, to my surprise and delight he accepted. And, now
1054 getting him now involved in biotech turned out to be a huge thing for San Diego,
1055 because the Burnham Institute – when we needed to find a bigger building for Gen-
1056 Probe, after we started to outgrow our space, he put together a consortium that built
1057 us a building with a lease back in Campus Point, which I don't think had ever been
1058 done in San Diego before. He was, he was the guy who had the original idea for
1059 Biocom. He was, he has become, he had, he became an incredible mover and shaker
1060 in San Diego and advocate of biotech. And, he's in his eighties today and he's still
1061 very involved. So, you know, I assume that would have happened without my
1062 intervention, but I actually can make the claim that I'm one who [Laugh] did get him
1063 initially involved in this, in this field. But, what were you asking? What was the main?

1064 **SHINDELL:** I was asking you who, other than Bill Otterson, were the main...?

1065 **BIRNDORF:** Okay, so there's Malin Burnham. A lot of the people that were at
1066 Hybritech became very involved in other things. Like David Hale was involved, you
1067 know, became involved in many, many community things, charities, and other
1068 industry groups. Ivor was involved. There were, there were a number of people back
1069 there that just became more and more involved in all aspects of biotech in San Diego.
1070 The government, you know, well I think that they, they applaud biotech and today
1071 they, they list it as one of their big areas and everything else. I, you know, and while
1072 they were . . .

1073 **SHINDELL:** The local government here? Yeah.

1074 **BIRNDORF:** Yeah. I'm talking about the local government. They never went out of
1075 their way, in my opinion. For example, there were many cities, and today if you want
1076 to set up a new biotech company there's many states that are, states and cities that
1077 are actively recruiting. They want, and they'll give you big incentive programs to
1078 come there. They'll give you tax incentives. They'll give you land. They'll give you
1079 buildings, you know. Look at what Florida just did for, taking the Research Institutes
1080 down there. But, back then California and San Diego I don't think they recognized
1081 initially the importance of biotech. They do now, of course. But back then, biotech
1082 grew here mainly because of the scientific institutions that are here or in San
1083 Francisco. You notice L.A. is not a hotbed of biotech. They don't have near the, other
1084 than, you know, they have a number of universities there, but they don't have the
1085 level of research going on that San Francisco and San Diego have.

1086 **SHINDELL:** Let me ask you something related to that.

1087 **BIRNDORF:** And the venture capital.

1088 **SHINDELL:** Uhm-hmm. Some people have suggested that the sort of clustering
1089 phenomenon of biotech and other high tech industries is one of the things that
1090 makes sort of local sectors effective, that the clustering phenomenon actually leads to
1091 better research with people, seeing each other more often, being able to draw on
1092 employees from other companies when starting new companies, etcetera. Now when
1093 you were starting out there obviously wasn't a cluster, and so . . .

1094 **BIRNDORF:** Well, there was in a sense. When I, when we were hiring the initial
1095 people for Hybritech, where did they come from? They came from Scripps, UCSD,
1096 and Salk.

1097 **SHINDELL:** So that was . . .

1098 **BIRNDORF:** So, because there was a large pool of highly technical people it made it
1099 much easier for me to start, to hire the initial group, for example, the first ten
1100 employees at Hybritech. If I was in Des Moines, Iowa, or – I'm not picking on Des
1101 Moines – but if I was in another place, where they didn't have that level of
1102 sophistication, it would have been much harder, if not impossible. So, there wasn't a
1103 cluster, but there was a cluster. There was a cluster of research institutions.

1104 **SHINDELL:** I see.

1105 **BIRNDORF:** And, I think that's what led to the cluster here more than anything. I
1106 mean, at, at Hybritech we brought in the technology from elsewhere. At Gen-Probe it
1107 was a local inventor. At Ligand it was the Salk Institute. At Neurocrine it was the Salk
1108 Institute. At Gensia it was UCSD. At, you know, at Hybritech was UCSD because we
1109 were at UCSD and started, and we brought over our technology from there. So, if you
1110 look back at it pretty much many – now, there's been companies that have just come
1111 here and said, "We want to, you know, either relocate to San Diego or we want to go
1112 start our company in San Diego." But many, you know, the fact that you have UCSD,
1113 Salk, and Scripps all within a mile of each other is a major advantage, and those
1114 things have grown so much since, you know, what they were back in, in the '70s when
1115 I started this.

1116 **SHINDELL:** Do you have any recollection, or did you get any impression at the time,
1117 of how your university colleagues felt about your entrepreneurial activity?

1118 **BIRNDORF:** Yeah. They were not happy. As I mentioned before, the physicists and
1119 chemists, this had been going on for a number of years where they were working with
1120 industry in one way or another. Either they went to industry or they collaborated
1121 with industry, consulted with industry, sold their patents to industry. That was all
1122 well and done, but the biologists hadn't really done that ever before, and it didn't
1123 really matter for me as a, as a lowly research associate to leave the university to do
1124 this, but Ivor got a lot of static for being involved with Hybritech. He, a lot of his
1125 peers resented the fact that he was involved in commercial activities. They saw it as a

1126 conflict. They resented that he might make money and, and did make money. They
1127 resented the fact that he might, you know, I think we might have funded things
1128 where there was another source of funding that they didn't have access to. I think it
1129 affected his career. It may have delayed promotions for him. He ultimately was
1130 promoted, but at some point he actually left the university. It wasn't during
1131 Hybritech's phase, but in the '90s he left to start his own cancer center.

1132 **SHINDELL:** Do you think these things have changed in the university?

1133 **BIRNDORF:** Yeah.

1134 **SHINDELL:** Yeah?

1135 **BIRNDORF:** Yeah. I think that over time the biologists now are where the physics, or
1136 the physicists and the chemists were back then, or even beyond that, you know. Now,
1137 it's rare where you find a scientist, well you know maybe young scientists are naïve
1138 and don't know what's going on yet, but the older guys who've been around, they're
1139 all attuned to commercial implications. They may not want to do it. They may not do
1140 it, but they at least know about it. They at least have heard about it. You know, they
1141 understand the concepts. Back then, you know, at Hybritech when I was dealing with
1142 patent offices, technology transfer offices in other universities, nobody had a clue
1143 what was going on. I actually would go around to the Society of University of Patent
1144 Administrators meetings that were held once a year and I made friends with these
1145 guys and took them out to dinner, and cultivated them so that when at their
1146 particular institution if something would come up that they would think of me and
1147 call me, and say, "This might be of interest to you." Or, when I was working with
1148 them it'd be a much better process because they knew me. And, that worked great for
1149 me.

1150 **SHINDELL:** So, you had to do a lot of social networking in order to, to --

1151 **BIRNDORF:** Back then, yeah.

1152 **SHINDELL:** -- make the system work?

1153 **BIRNDORF:** And, I burned out on it, [Laugh] quite frankly. It has been a problem.
1154 Because, as I've gotten older it's been harder and harder to do that.

1155 **SHINDELL:** Why is that? Do you just have less tolerance for the sort of schmoozing?

1156 **BIRNDORF:** Yeah.

1157 **SHINDELL:** Yeah.

1158 **BIRNDORF:** Yeah. I mean, how many rubber chicken dinners can you go to over
1159 [Laugh] your lifetime? I used to go to all that stuff and over time I've just backed away
1160 from it because it just became too difficult. It just, I mean I just made, I mean I'm sure
1161 there's other people that it got better, it was easier. For me it got harder. [Laugh]

1162 **SHINDELL:** The early work that you did and the first few companies that you were
1163 involved with, some would say that they sort of formed the backbone of the cluster
1164 that exists today. Do you think that it's become easier to start a biotech company
1165 these days?

1166 **BIRNDORF:** In certain ways, yes. Certainly, it's easier from a networking point of
1167 view. The network exists today. You don't have to go make it. So, if you want to start
1168 a company you can find where to talk to a venture capitalist very easily. You can –
1169 now, I'm not saying you can get in, but you can at least know where to try. I mean,
1170 back then we didn't, you know, we didn't know what to do. We went, we, by
1171 serendipity we got into see Brook. In future companies, and Brook ended up
1172 investing in every one of the companies subsequently, so that was a great resource for
1173 me and Ivor. He did IDEC with us. He did Gen-Probe. He did Nanogen. He did
1174 Neurocrine. He did Gensia. He, you know, he did all of them, Ligand. But, I think it's,
1175 it's easier in that sense. You know, one of the problems though is back then there
1176 were no public companies. There were no cyclical funding periods, like there have
1177 subsequently been because there weren't any funding periods back then. So, as
1178 companies got bigger and as they became public, and as you started getting more
1179 companies, now new entrepreneurs are faced with things that we weren't faced with.
1180 For example, if it's a bad time in the industry and people aren't investing, their deal
1181 may not get funded. Whereas, back then our deal would, would or would not get
1182 funded probably based on this technical merit more than the funding. And, that's not
1183 to say that a deal that has great technology won't get funded, but it may get harder to
1184 get it funded than it would have been back then because you happen to go out
1185 looking at a bad time. The stock market's crashing. Investors are investing in other
1186 things. The Internet boom just busted, or, you know, that that kind of thing.

1187 **SHINDELL:** Now, the model that you set with Hybritech is sort of one in which you
1188 do a lot of the initial work and the development, and then a larger company, it was
1189 Eli Lilly, is that right, came and . . .

1190 **BIRNDORF:** And, yeah, and bought it.

1191 **SHINDELL:** And bought it?

1192 **BIRNDORF:** Yeah.

1193 **SHINDELL:** And that sort of seems to be the model that a lot of biotech startups are
1194 sort of aiming for here in San Diego. Do you think that that's a good model or is that
1195 just the way things sort of happened for Hybritech?

1196 **BIRNDORF:** Well, I think that sort of just happened for Hybritech. I don't, I mean
1197 Hybritech was making products and was getting to be profitable on its own and
1198 probably could have done what Gen-Probe did. Gen-Probe is a good example where
1199 we sold the company and then it spun out again and now it's its own company and
1200 doing really well. It's like, you know, one of the biggest biotech companies in the
1201 country, certainly in its field. I, you know, it's all tied, I think, to venture capital's
1202 expectation of exit strategy. What kind of exit strategies do you have? You can either
1203 build a company up to grow it and become a big company on its own, but that's
1204 assuming that you got the management, money, and products to get there. And, in
1205 therapeutics that takes a huge amount of money. You can, you, and in that case I
1206 don't, the venture capitalists would have to be bought out by somebody at some
1207 point. They have to get liquid. So, how do they get liquid? There's that strategy.
1208 There's the strategy of going public. And, they get liquid by having a public currency
1209 to trade, and to distribute to their limiteds, and the only other one is to be bought
1210 out by somebody. So, there's only, there's a limited number of ways for the venture
1211 guys to get a return on their investment. I think that if you start a company today you
1212 can decide before you get going what your exit strategy is, and try and develop the
1213 company towards that. So, if you want to take venture money from this front and you
1214 say "Our exit strategy is to go public," you're now dependent on these cycles of the
1215 public markets and whether or not that public market is open or not. Right? Which,
1216 it's pretty much not open right now. Or, if you start a company saying, "I'm not
1217 planning to go public, but I'm going to build this up and then sell it," that's another
1218 strategy you can take. But then, you're also, have to be able to sell it. And, you know,

1219 it's not that easy to build up a company and sell it for big bucks. I mean, these are all
1220 very difficult things to do and risky.

1221 **SHINDELL:** Uhm-hmm. At the same time it seems like the big pharmaceutical
1222 companies, rather than investing in their own development are looking for startup
1223 companies?

1224 **BIRNDORF:** And it's become more and more. At first, you know, biotech was a
1225 threat to them.

1226 **SHINDELL:** How did, how did they treat you in the beginning?

1227 **BIRNDORF:** You know, they, they sort of scoffed at us the little upstart, but, you
1228 know, everything changes when you're successful. I mean, if your, if your technology
1229 works, whatever it is, and you're developing products that are selling, and people are
1230 buying them, and I mean the proof of the pie is in the eating, [Laugh] right? And so,
1231 even Hybritech, back then, Lilly wanted to get in the, they had a big strategic
1232 initiative to get into diagnostics. They were going to, they had certain diagnostics
1233 already. They wanted to grow that. Hybritech fit right into that strategy. The thing
1234 they didn't realize was that, you know, their culture killed their, killed the culture in
1235 Hybritech, and all the good people left. And, you know.

1236 **SHINDELL:** What, what would you say was their culture compared to yours?

1237 **BIRNDORF:** Well, they had a very stiff bureaucratic – I mean, you had to wear a blue
1238 or gray suit. That was the, you know, there was a very, they were not an
1239 entrepreneurial culture. They were a bureaucratic big company culture and those two
1240 don't necessarily mix.

1241 **SHINDELL:** One thing I think you've emphasized . . .

1242 **BIRNDORF:** I mean, Hybritech died when Lilly, because Lilly bought them. So, it
1243 was very good for all the investors in Hybritech. It was not good for Lilly, or
1244 subsequent employees of Hybritech. Hybritech ended up basically going down, down,
1245 down, and then it got sold to Beckman, and then Beckman sold it to whoever. I don't
1246 remember the lineage right now but it turned out to be virtually nothing.

1247 **SHINDELL:** Hmm. How, how disappointed were you by that? I mean, did you still
1248 think of Hybritech – no, I know. But, did you still sort of think of Hybritech as your
1249 baby, or anything like that?

1250 **BIRNDORF:** I did, sure. I did. But, once I left Hybritech then Gen-Probe was my
1251 baby.

1252 **SHINDELL:** Uhm-hmm. Okay.

1253 **BIRNDORF:** And even though, and I was tickled when Hybritech was sold because I
1254 made a lot of money. So, I was gone. I had my own second entity. I was on the Board
1255 of Directors. I was higher up in the organization. I had, I was a founder. I had more
1256 stock. And, you know, you don't look back, in a way.

1257 **SHINDELL:** Yeah. Well, there might be one, one way in which you look back. I mean,
1258 how did your experiences with Hybritech affect your activities, your later activities?

1259 **BIRNDORF:** Oh, they, they affected it greatly. I mean, you know, things I did at
1260 Hybritech I then did at subsequent other companies. I mean . . .

1261 **SHINDELL:** And were there . . .

1262 **BIRNDORF:** In a sense some of the things you do when you start a company are
1263 cookie-cutter. What were you going to say?

1264 **SHINDELL:** Oh, just, if there were mistakes you made with Hybritech that you tried
1265 not to repeat with later companies or anything like that, you know? Specific sort of
1266 experiences that carried forward into later ventures?

1267 **BIRNDORF:** I would say that's absolutely true. I can't think of what those are this
1268 moment, but I'm sure there are things that I learned at Hybritech that I did not do at
1269 Gen-Probe because they didn't work at Hybritech. On the other hand, everything's
1270 different, you know. Gen-Probe, different technology. Some similarities, diagnostics.
1271 Hybritech was diagnostics. So, they were similar. You know, what I learned, I learned
1272 a lot of things for my personal, like I said. I wasn't going to do it unless I was on the
1273 Board of Directors this time. I wasn't going to do it unless I had equal pay and stock
1274 with the other founders. That kind of thing. So, I got my, my personal objectives were
1275 to be on par with everybody else, not to have one guy get more than the other

1276 because his name was better known [Laugh] or, or not that, but because he was a
1277 more proven entity. Yeah.

1278 **SHINDELL:** And, can you tell me a little bit about starting Gen-Probe?

1279 **BIRNDORF:** Yeah.

1280 **SHINDELL:** Or, would you like to take a break first?

1281 **BIRNDORF:** Yeah. Yeah. I would.

1282 **SHINDELL:** We've been going for about an hour.

1283 **BIRNDORF:** Yeah, I would like to take a break.

1284 **SHINDELL:** Okay.

1285 **BIRNDORF:** Oh yeah, we've been going for over – where's my glasses?

1286 **SHINDELL:** Start it again. Yeah, so please tell me about how you went about
1287 founding Gen-Probe.

1288 **BIRNDORF:** So, Gen-Probe, I was at Hybritech now for about five years and, you
1289 know, I never, I was not – while I loved the company, Ted Greene and I clashed a bit.
1290 I never felt my, my contribution was recognized there after the initial stuff. And, I
1291 became very close friends with Tom Adams, who was the head of Research, sort of
1292 because of our jobs. Because, I would find things and bring them in and he would, he
1293 and I would evaluate them whether or not we wanted to pursue them. That kind of
1294 thing. And we, we found this one, this guy named Dave Cohen had this invention
1295 where he said he could use Ribosome RNA as a method for detecting bacteria.
1296 Nobody had thought that ribosome RNA could be used to do this, that it was, they
1297 thought that between species it was so highly conserved that it was virtually the
1298 same, and it turns out it wasn't and that there was enough diversity that you could
1299 now use it to identify different organisms. And, because there were so many of the
1300 ribosome RNAs in a cell, in an organism, you could find, the sensitivity was, there was
1301 enough sensitivity to find them because there were so many of them. That the
1302 current sensitivity in a, of the technology could find these things. You didn't need
1303 amplification like you need now. So, we recommended to Hybritech that we look into
1304 this. And, the response, we had a committee that met, sort of an executive committee

that looked at opportunities. The result of that was, "Well, this is nucleic acids. It's different than what we do, it would be a whole, it would be a different area. It would be too, too much bandwidth. We don't have the bandwidth for this right now, so we're going to pass." So, Tom and I kept thinking about this and we, we decided that we should perhaps license this ourselves and start a new company. So, we went to this inventor and we talked to him about that and he was positively inclined, and so we, we went back to the Hybritech Board and we made a proposal that we could take this and go do it ourselves. You know, that we weren't stealing a corporate opportunity, that we were, you know, being totally upfront. And, they said, you know, ultimately they said okay and that they actually wanted to invest in it. So, that's what we did. It was sort of similar. We went to the lawyers, started doing the intellectual property, and the corporate deal, and the name, and went and found space. I found that lab then in, I think it was in April/May of '84 is when I left, and it was sort of the same thing. It was me, Tom left too. Tom was going to be the CEO. I was going to be the vice president of, the senior VP or executive VP, and Dave Cohen was the inventor. And, the Board was going to be Tom, and I, and investors. So, we did that and it was very similar. I found that space. Unfortunately, it was way on the other side of San Diego. It was far away from everything. We went and we got the space, and I brought in Fisher, [Laugh] and I did the whole thing, got all the equipment, and we started hiring people, and we got everybody hired, and, you know, we started going. And we, we immediately ran, we got, Kleiner Perkins put in some money and Hybritech put in some money, and we started going and we ran into this huge technical problem right away. We were going after, we were trying to find what products we should do and we started looking at mycoplasma in pneumonia and tissue culture. It was a common contaminant and there was no good way to do it, and we used that as a proof of principle and that worked. And, that was pretty good, but then when we tried to go to the first commercial product, which was Legionnaire's Disease, which had just come out. Now, there was a lot of hoopla about it, but you had to get it from sputa. That was the sample, and it turns out that when you took sputa and you tried to extract RNA from it there was, there was a chemical called [Rnase] in the sputa that chewed up the RNA before you could find it.

SHINDELL: An enzyme?

BIRNDORF: And it was a big technical problem, and I remember sort of the second year of Gen-Probe was when we had this huge problem and we were running out of money, we were working on solving this problem, and every week it's going on

longer, and longer, and longer, and finally we did solve the problem, but it was almost the end of the company because of that technical problem. That was also when I got Malin Burnham to join the Board. You know, we were the first, really the first nucleic acid diagnostics company, the first molecular company. Really, we paved the way for molecular diagnostics, even though it was a slightly different format than is used today. It was using this ribosomal RNA. But, those patents that we filed back then held up for as long as they, people tried to challenge that for years. There was companies that wanted that and tried to get it from us, and – anyway, that was an experience in the sense that we kept raising money and finally we went public in '87. Was it '87 or '88? When was the big crash? Was it October '88?

SHINDELL: Eighty-eight sounds right.

BIRNDORF: Yeah. I think it was '88. We went public three weeks before the big crash. We went public at a, at a \$7 a share price and three weeks later the market crashed and our stock went down to \$3 and it stayed there. And, one of the problems was that Tom Adams was a great scientist and one of the best product development guys I ever knew, but when it came to being a CEO he wasn't exactly perfect, and as the company grew he sort of outgrew it and the Board wanted to bring in a CEO. They brought in – so, he compromised and brought in this one guy as a COO first, and Tom really wouldn't let them do their jobs. And, this inventor and I, Dave Cohen, didn't get along. And then, so in 1988 I got in this big fight with Dave Cohen and I quit. And, I just left. At the end of '88 I left the company. I stayed on the Board, though. In 1989, after the crash, we couldn't get our stock back up and we, I had just done a big deal with the Japanese before I left, a \$15 million, five-year deal with a company called Chugai. And, the company was struggling. We needed money desperately. We needed to raise at least \$10 million, and that was a minimum amount. And because the stock was low and the market was terrible, to raise money we would have had to raise it as a significant discount to market. And because of Adams' problems at the Board level we decided it would be easier to sell than fight. And, we got an offer from, we had already received an offer to buy the company from Eli Lilly but they wouldn't come up to our price. Then, Roche came in and gave us an offer. We had been talking with Boehringer-Manheim and I went to Chugai and said, "Look, all these people are trying to buy us. You guys have this big deal with us. You should buy us." And, they did and they came in and offered us more money than the other guys had by far, a significant premium. We had \$3 stock and I think they offered \$6. So, in 1989 we ended up selling Gen-Probe to Chugai for about \$100 million

in cash. And, I had left working in the company and, at the end of '88, and so by the end of '89 the company was sold. When I left the company Brook came to me and asked me if I would consider running another company as an interim job, and that was called Progenics. And, it turns out that Brook and two other venture capitalists had licensed some technology out of Scripps for finding oncogene proteins in urine and it used an electrophoretic technology to do that, and the scientist's name was Henry Neiman. And, they called the company Progenics and it's head office is at General Atomics. So, I went in there and I looked at it and I said, "Okay." So, I had a job right away and I went over there. And, within the first six months I realized that the technology didn't work. It was just too complicated. It was, you couldn't, it was not reproducible, and it was just not going to work as a diagnostic for these oncogene proteins. And, I went out and I started looking around for a new technology to see if there was something else that I could find that was either, would augment that technology or that would be something else we could do. And I ended up having a discussion with a guy named Ron Evans over at the Salk Institute, who was a very smart guy and he was involved in looking at something called intracellular receptors for the steroid hormones. Things like estrogen, progesterone, glucocorticoids. And, he had isolated a number of these receptors for these steroids, which are powerful drugs. And, I did, I thought that this was very good technology and I went and I did a deal with the Salk Institute to license the whole package exclusively to Progenics. And, we decided to license, the board agreed. We decided to get rid of all the employees that were involved with the other stuff, Neiman, and the rest of them, change the name of the company, and do basically a restart around this new technology called . . .

SHINDELL: And just give up on the oncogene stuff?

BIRNDORF: Give up on the oncogene stuff. And so, the new company was called Ligand, and it was based on these intracellular receptors. And, that was great fun because I wasn't involved with the Progenics licensing, you know. I had never looked at that before I came, and when I saw it I never liked it and I didn't think it was going to work, and it didn't, and it never has. Even to this day.

SHINDELL: The people who had been involved in that, that you let go, did they go on to do that same research somewhere else or . . .

BIRNDORF: Yeah. And Neiman got a job at a university back east somewhere, in Pittsburgh I think, and continued to work on this, but I don't think it ever, other than as research, it never resulted in commercial activity. So, we started Ligand. That was in, I started it in '88, so in '89, and it turns out that when we started Hybritech remember I told you that Lyon & Lyon, this guy was our patent attorney, he actually went and became general counsel at Genentech. And, they gave us a new attorney named Larry Respass. So, Larry was working with us in the law firm at Hybritech and at some point I recruited him to join Hybritech full-time as our general counsel. And, he came onboard and he was very involved in defending Hybritech's IP that they developed, and he successfully won this big case and all that stuff. And then, when Hybritech was sold I recruited him to Gen-Probe. So, he was now general counsel at Gen-Probe. And then when I left Gen-Probe in 1989, '88, he then left in '89 and came over to the new Ligand, and he was there for many years. I stayed at Ligand then through 1991 and we, we left out, what we left out was while I started Gen-Probe in '84, in '85 Ivor and I got together and started talking about, with this other guy named Bob Sobel, about how to use monoclonal antibodies in a therapeutic way to treat lymphoma. And, we started IDEC [Laugh] in 1985. And, I was on, I was on the Board of Directors of IDEC but I was not, because I was working at Gen-Probe I didn't join IDEC. So, IDEC was going on and then in '86 or, I think it was '86, there was another group that formed that was looking at this technology out of UC for cardiac stuff, congestive heart failure and stuff, which formed the basis -- we actually had the first board meeting in my kitchen at home -- [Laugh] for Gensia. And, I was on the Board of that. So, I was involved in all these things at one level or another. But, at Ligand, so after I changed the company we started going on, developing the assays for these receptors and molecules. I stayed until '91, and then I brought in a president. And, this new guy didn't want me around. He didn't want a founder around, and, you know, because people have had problems in the past. So, I stayed on the Board there but I left the company in '91 and I took off a year of '92. I basically took that year off and, and part of '93, and then when I came back is when I got involved with Nanogen. And, I've been involved with Nanogen since '93. So, that's now . . .

SHINDELL: That brings us pretty up to date, yeah.

BIRNDORF: Yeah. I mean, Neurocrine was something that happened in '92, and there's been a number of other smaller startups that I've been around for the last four or five years, other than that. But that, yeah, that pretty much brings you up to date.

1441 **SHINDELL:** That year and a half break, that's one of the only breaks, it seems, like
1442 you've ever taken? Yeah. [Laugh]

1443 **BIRNDORF:** That is the only break I ever took. I, I left in February of – no,
1444 December. I think I left Ligand in February of '92 and I came back in April, I spent the
1445 winter skiing, of '92-93 in Telluride. And, when I came back in April of '93 from
1446 Telluride is when I started getting active in Nanogen. So, yeah. So, from, for about a
1447 year and, a little over a year, a year and a few months I took off. That was my only
1448 break. Yeah.

1449 **SHINDELL:** Yeah. You must have felt like you deserved a break at that point, I would
1450 think?

1451 **BIRNDORF:** I did.

1452 **SHINDELL:** Yeah.

1453 **BIRNDORF:** I was really burnt out. And, I feel like I deserve a break now. [Laughter]
1454 But, I got to get this thing up and running. You know, I got to get this thing cleared
1455 up before I go.

1456 **SHINDELL:** Yeah.

1457 **BIRNDORF:** Yeah.

1458 **SHINDELL:** Well, I have basically one last set of questions that are sort of meant to, I
1459 guess, close the interview. Unless there's . . .

1460 **BIRNDORF:** Where do the questions come from? They're yours, or the group puts
1461 them together, or what?

1462 **SHINDELL:** I wrote up basically a sort of a sample stock set up questions, and then
1463 I've tried to sort of ask as few of them as possible. Because, the truth is, you know,
1464 you've touched on a lot of the stuff that was the stuff that we were going to ask about
1465 anyway. But yeah, I drew them up based on a reading of articles that have been
1466 written about biotech and sort of what are the big questions people are interested in
1467 in biotech, and stuff like that.

1468 **BIRNDORF:** So, what's your questions?

1469 **SHINDELL:** The closing questions are, let's see. Some of these we can skip because I
1470 think you've already asked them, or answered them. So, we'll just go straight to, I
1471 guess they're sort of the general, generalized questions about your experiences and
1472 how you would sort of sum them up? How you would evaluate your career, in other
1473 words. So, what do you think is the most important change that's happened in San
1474 Diego biotech, what some people call "Biotech Beach," during your time here?

1475 **BIRNDORF:** Well, I mean, you know in a sense it's the awareness, the network, the
1476 fact that this is an established thing. You know, back when I started there was
1477 nothing, and now there's everything. And, you know, there's companies, I don't
1478 know, I forget the number, but it's something like a hundred companies a year are
1479 starting in San Diego in biotech. So, it's obviously established here now. All of the
1480 things that we worried about are not worries anymore, venture capital, the network,
1481 how do you get access to supplies, buildings, labs, all those things are pretty much
1482 taken for granted. You know, I think it's the sophistication that's developed over the
1483 years has changed the fundamental prospect of how you start a company, as it would
1484 have in any case in any successful industry as it developed. Just like the chemists and
1485 the physicists had done in the first part of the Twentieth Century, developing
1486 polymers, or for DuPont, and all those companies that sprung up around new
1487 technologies, and new chemistries, new physics. The same thing happened with
1488 biologists, it just took longer. Obviously the, the subject has become, well one of the
1489 issues is the information is now, comes faster and there, you can't keep up with it.
1490 And so, no matter what the development of the Internet has changed things.

1491 **SHINDELL:** Uhm-hmm. Definitely. Yeah.

1492 **BIRNDORF:** But, the amount of information, the amount, number of meetings, the
1493 interplay between scientists and, you know, now you can work much easier with
1494 somebody in, in Russia, or with the Internet changed a lot of, you don't necessarily
1495 have to work with a guy down the street here. It's easier to work with people a longer
1496 way because of the way information has disseminated today so easily. I think that's
1497 changed things a lot. I don't know that that's the most important thing. I think access
1498 to capital, the ease at which people can raise money around a good idea has changed
1499 dramatically since I started. You know, each year you see the amount of funding that
1500 comes into San Diego, venture-backed funding is huge. So, venture capitalists have
1501 raised bigger and bigger funds. They need to invest more and more money in a
1502 particular deal to get enough ownership in it, to get a return that's meaningful. So,

people are able to raise larger amounts sooner than they could have before. Those kinds of things have changed and helped entrepreneurs be able to start companies faster with enough money to last them longer, or to do things faster than they could have in the past. The thing about pharma, recognizing that they can't do everything and now being much more open to collaborate and/or buy smaller companies has dramatically changed over the years. It's probably at its peak right now. It will probably only get better. It costs more and more to develop a drug and the regulation is getting harder and harder. So, those are all things that play into this.

SHINDELL: Okay. If you have any idea of this one. Did these changes that you've just described occur because of local changes in San Diego or larger changes in science? I think you've sort of touched on that. But, maybe you could get a little bit closer, or maybe focus in a little bit more, because I think you've talked about sort of the bigger changes. But, what about sort of local changes in San Diego? Do you think that the . . .

BIRNDORF: Well, the local changes are what I said, it connects back going, it's sort of declined, now it's starting up again. You've got these industry groups that are very active here now. You've still got the fundamental Scripps, Salk, and UCSD combo, that has, is the basis of everything and now you've got all these institutes that have sprung up. The Burnham has become big, and there's Torrey Pines Institute, and all these other institutes, the Sidney Kimmel Cancer Center, or this and that, so you've got much more of an infrastructure here in the city. Now, in terms of state government I'm not sure that that's changed all that much [Laugh] over the last thirty years, you know. The state, the city government has been screwed up for many years and it continues to be screwed up, and they, I don't think they've really ever, other than recognizing that bio, that biotech is a great source of tax income for the city, that it's a clean industry, white-collar industry, it's one that they're fortunate to have here. I just saw a note yesterday saying that the, you know, in real estate the one bright light in this [Laugh] terrible real estate market has been the bioscience side of things where labs are still, you know, in demand and at a premium, and that landlords are still doing well with laboratories. So, I think, you know, from that point of view I don't think that the city government has ever really bent over backwards to help the biotech industry.

SHINDELL: So, you think . . .

BIRNDORF: Certain mayors have been more or less, you know, inclined to be favorable toward biotech, but, you know, for example source of clean and, clean and abundant water is imperative to certain biotech operations. The whole thing of the radioactive waste in the state of California has always been a problem for years. So, you know, while everybody likes the positive aspects of tax revenue, and jobs, a lot of the issues that have plagued us have never gone away. And, as I said before you see other states are actively pursuing biotech. They're trying to get, they're trying to get companies to move to their state or startup in their state, offering big incentive programs, tax, and real estate, and that kind of thing. California has never really done that. They didn't have to because they had it all here. And again, it all boils down to, in my opinion, the real thing that made San Diego a cluster was the Scripps, Salk, UCSD right there with trained people and technology development that was like, that people could get and license, and, like I got the stuff from the Salk Institute to start Ligand, for example. That cluster that stayed here and grown has really made this one of the premier spots in the country.

SHINDELL: So – this isn't actually one of the questions I had prepared, but do you think that, for example, the new venture in Florida will be successful without having the, sort of . . .

BIRNDORF: If they can get those institutes. You know, one mistake, I think, is that they – well, they put them all over the state, you know. They might have tried to put them all in one spot. I don't know if that would have worked or not. I don't know the dynamics of that. But, if they get those institutes grounded down there and if they get them to be huge sources of government funding that comes into the state, that creates a big talent pool of jobs and creates technology, I think they could be. I think it was very smart of them to do that. And, they went and they took already existing institutes and didn't change what's here, just expanded. It's a win-win. It's a win for the institutes that they get more funding, and it's going to, time will tell if they win, you know, if it works or not, but it's a good bet.

SHINDELL: Okay.

BIRNDORF: I think.

SHINDELL: Let's see, I think you've already covered this. What made bio, Biotech Beach successful? And, do you think that there's anything sort of that continues to

threaten the success of biotech in San Diego, or has it overcome all of the hurdles against it?

BIRNDORF: Well, I don't know, you know. It's hard for me to – the biggest thing that I, as a CEO, have worried about over the years in all the companies I've been involved with is always money. I mean, money is, is the constant bane of a startup and of a growing company. You always need access to capital and whether that's venture capital, or public capital, or corporate capital, or government capital I suppose, of the four sources, regardless of where you get the money that's the bottom line. And, to the extent the economy slows down, money will slow down. And, I think that that's the only risk, is the continued funding of biotech over the years. I don't, you know, science is going to continue on and science is the final arbitrator of these commercial activities in biotech. And, science will always win, you know. So, I think there's always going to be new science. There's always going to be new technologies that come out of that science that are commercializable. And so, biotech's going to continue on and it's going to get, you know, there's going to be discoveries in the next decade that are going to continue to awe everybody. The genome is the latest. You've got nanotech, and you've got all these things coming up that can really define new things. So, I think it, yeah, I think it's established. I think the issue is going to be, "How do you fund all this stuff?" The government funding is drying up. Venture capital is spotty. You know, some years it's great. Some years it's not so great. When the, the public markets are dried up too. So, you know, it's, the sources of funding are changing, are ever-changing. So.

SHINDELL: Part of your answer to the last question leads me to the next one, which is, based on your experiences in biotech and having come from university settings into the biotech sector, what, how would you characterize the relationship between the biosciences and biotechnology? Is it a direct sort of transfer of information from science to technology, or is it more of a back and forth between technology and science?

BIRNDORF: I, I think that a successful one has to be a back and forth. It's very difficult to go to an inventor and just take what they have and take it out of their setting and do it by yourself, without their help. So, it's very important to have a inventor be involved with your – in other words, there's a back and forth and it continues on. There's improvements made in the lab that need to be translated to the commercial operation, and back and forth, and back and forth. Sometimes it's the

1602 opposite. Sometimes the commercial guys discover something that the scientist
1603 wants. You know, so I think it's a much better proposition if the, if it's a back and
1604 forth, rather than just a one-way street.

1605 **SHINDELL:** Yeah. That would seem . . .

1606 **BIRNDORF:** Now, that doesn't mean that it can't be a one-way street. If something is
1607 very simple and it's just an invention that's a product, and it just needs to be
1608 commercialized, like a device for a stint or something like that, maybe that's, doesn't
1609 require that much. But, in the real biosciences arena, where you're talking about
1610 intracellular receptors, or ribosomal RNA, things like that, you do need the
1611 interactions.

1612 **SHINDELL:** Uhm-hmm. So, it sounds like you wouldn't draw a very firm line
1613 between, or make a firm distinction between science and technology. They're sort of
1614 wrapped up together, in your view?

1615 **BIRNDORF:** I think they're wrapped up together. Yeah. I mean, clearly there, the
1616 line is between technology development and commercial development, I suppose.

1617 **SHINDELL:** Ah. Okay.

1618 **BIRNDORF:** There's a big difference between developing a technology and
1619 developing a product.

1620 **SHINDELL:** Uhm-hmm. That's interesting. Let's see. I think we've covered that. How
1621 did your experience here in San Diego and in biotech affect your life? Sort of a
1622 general sort of reflective question, I guess.

1623 **BIRNDORF:** Before I answer that, the other thing I wanted to say though is, I think
1624 the other thing that's affecting companies in general though, is the whole space in the
1625 United States of this whole Sarbanes-Oxley accounting. It is really becoming much
1626 more difficult to develop a public company and to be competitive in the United
1627 States versus other countries. And I want, and in terms of expense it's even more
1628 difficult to be in California versus other states, for example. It probably costs you ten
1629 percent more to do things in California than it does in Iowa, or somewhere else. So,
1630 you've got all of those other things that are going on. The thing that I'm seeing over
1631 the years is it almost seems like our Congress and our Senate, our Congress, or the
1632 House and the Senate are almost trying to do their best to make American business

1633 noncompetitive on a global basis because of all of these rules and regulations. The
1634 overregulation of, of science. You look at the stem cell issue, for example, the
1635 overregulation based on religious beliefs. You got Sarbanes-Oxley, the regulation of
1636 companies, all the new accounting rules. I mean, not only do they cost a lot but
1637 they're, they're really dampening our ability to be competitive on a world-wide basis.
1638 Countries, companies in other countries that don't have all this crap, if they're done
1639 right and if they had the ability to raise money, could kill us because of the, they can
1640 get to the market faster and they can develop products that – just for example in what
1641 we do here, molecular diagnostics have become so regulated in the U.S. that it's, and
1642 they're so differently and less regulated in Europe, it's so much easier to do it in
1643 Europe than it is the U.S. It's ridiculous. And, it's becoming almost to the point where
1644 people don't want to even compete in the U.S. market. So, what was the other
1645 [Laugh] – how does it change my life?

1646 **SHINDELL:** Yeah.

1647 **BIRNDORF:** Well, obviously it's changed my life. It's changed my life from a
1648 financial point of view dramatically. I mean, I don't know if, what I would have ended
1649 up doing with myself had I not done this, and I don't know if I would have been
1650 successful financially or not. But certainly, it's made a major impact on my life in
1651 terms of what I've ended up doing. And, the answer's yes. [Laugh]

1652 **SHINDELL:** Yeah. Because you never really dreamed that, or maybe not dreamed,
1653 but expected this would be where you would, would end up when you were in say
1654 your mid twenties, or . . .

1655 **BIRNDORF:** No, I never thought that I would be involved in – you know, at one
1656 point I wanted to be a scientist, and I thought I might be a scientist working – I guess
1657 I envisioned working in like a school or something like that, or maybe in a company.
1658 I'm not sure. I don't think I ever got that far in my thinking. You know, I also thought
1659 that I might go, end up going to medical school eventually. I'm sort of glad I didn't.
1660 When I look at the people that went to medical school that were my, you know, my
1661 schoolmates that ended up going, none of them are particularly happy today. I mean,
1662 with capitation and all the, you know, they deal with sick people, so a lot of them,
1663 you know, some of them still enjoy it. Some of them don't. A lot of them have gotten
1664 out of medicine because they didn't like it. I just like the fact that the other, you
1665 know, I haven't talked about the altruistic point of view of this but the fact is that

we've developed a huge number of products over the years that have helped people a lot, saved a lot of lives, Rituxan, and Zevalin at IDEC, huge benefit to people with lymphoma and other diseases. The PSA antigen for prostate cancer I'm sure, millions of men have been early detected prostate cancer and saved their lives. What other products? You know, Chlamydia GC test at Gen-Probe, getting STDs diagnosed early, preventing the spread, and the medical problems to the person that has them. So that, we have really changed the world from a medical point of view with many of the products and so that's very gratifying. I mean, you know, you don't think about that every day, but you know, there are times when I really do think about how those products, you know, one legacy when I move on to the great majority [Laugh] I, at least I can say that some of the things I did do had a major impact on healthcare in the world. So that, that's good.

SHINDELL: Uhm-hmm. Yeah. That sort of leads into, or actually, you know, makes me wonder, you know, you described in the first interview that we did of your younger days your sort of hippy days, what do you think that, if you encountered yourself today at that age, [Laugh] what would your hippy-self think of you today?

BIRNDORF: Think I sold out. [Laughter]

SHINDELL: But, you don't feel that way?

BIRNDORF: Well, you know, sometimes. You know, back then it was peace, love. I think I did change, you know. I became – I think when people make money they tend to become conservative, somewhat, politically, or many do. I think I did for a while. I think I go back and forth. I agree with what I believe in and it's not necessarily what any one party believes in. I believe in what I like to believe in. But, I do think that I'm very different than those days. In a way I miss those days. Those were very carefree, [Laugh] and stressless years, but I suppose that's with everybody when they're in their late teens and early twenties, everybody's searching for what they want to do. And, I mean you know, I'm always, to me all my life one of the key things that have driven me is to not be bored. And, when I feel bored it really, it makes me depressed. I can't really, I'm not at my best if I'm bored, and I'm bored a lot. And, for me it's real important to be, regardless of what it is to be interested in what you're doing. If you have that, to me you have everything. To me, having that, that gives you the sense of urgency. The drive is to be passionate about something, whatever it is. It can be art. It can be science. It can be business. It can -- whatever it is. As long as it's something

1699 that you're passionate about. To me, what's the most, what I've been most passionate
1700 about has been startups. So, for example, I'm not that passionate about Nanogen as a
1701 fifteen-year-old not-startup company. I'm much more passionate about things that I
1702 believe in and that are a startup phase that I can work on and grow something from
1703 an idea to a reality. That's much more fun for me and much more exciting for me
1704 than having a company that's all rules and regulations, and you can't do this, and you
1705 can't do that. I like those early days of a startup where people are just creative and the
1706 juices are flowing. Those are the best days, for me.

1707 **SHINDELL:** Okay. Would you say then that you are attracted to risk, or to . . .

1708 **BIRNDORF:** You know, risk really, you don't consider you don't consider losing
1709 when you're in those days.

1710 **SHINDELL:** You just think about winning?

1711 **BIRNDORF:** You just think about winning. That's right. Losing isn't even on your
1712 mind. It's, "This is going to work because it works. It, you know, it's good." You
1713 believe in it so much that losing isn't even an option.

1714 **SHINDELL:** Okay.

1715 **BIRNDORF:** Now, that's the way it used to be. I don't know, since I'm not involved in
1716 any real startup today that's like that, I don't know how I would feel then. I think it's
1717 become harder and harder to fund things, and so to me the risk is that you start
1718 something and you can't get it funded for, for reasons having nothing to do with
1719 whether it's good or bad. That to me is, is a scary proposition. You get down a road
1720 and then you can't fund it then what do you got to do? You either got to shut it down
1721 or you got to continue doing it at a very low level that doesn't make sense, and I don't
1722 like that situation. You know, that's happened in several things I've done in the last
1723 five years. So. Ever since 2000 when the bubble burst I think it's been much harder to
1724 get some kind, some startups done.

1725 **SHINDELL:** Uhm-hmm. Let's see. So, is there anything, any question that I should
1726 have asked you that I didn't? Anything you can think of?

1727 **BIRNDORF:** No, I think you covered everything.

1728 **SHINDELL:** Okay.

1729 **BIRNDORF:** At least not that, not that I can think of right at this moment.

1730 **SHINDELL:** Okay. And, I guess the last question is, are there other scientists or
1731 individuals who you think we should interview for the project? Who would you
1732 recommend interviewing?

1733 **BIRNDORF:** Well, I would certainly, I would interview Malin Burnham. I would
1734 interview Ivor. I would interview Brook Byers. I would interview Ted Greene. I would
1735 interview David Hale. That's, that's a good group right there.

1736 **SHINDELL:** Okay. Then, if you don't have any, anything else to add?

1737 **BIRNDORF:** No. I don't know. If I think of something I'll let you know.

1738 **SHINDELL:** Yeah. Please do.

1739 **BIRNDORF:** Okay.

1740 **SHINDELL:** Well, thank you very much.

1741 **BIRNDORF:** You're welcome.

1742 **END OF 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.