Oral History of

Andrew Alm Benson

Interview conducted by Laura Harkewicz

26 September 2006

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ABSTRACT:

Andrew Alm Benson was interviewed in the Helen Raitt Room at the Scripps Institution of Oceanography Library on September 26, 2006. Benson was born in Modesto, California on September 24, 1917. He received his B.S. in chemistry in 1939 from the University of California at Berkeley. In 1942, he received his Ph. D. in organic chemistry from the California Institute of Technology. He was an instructor in the Department of Chemistry and Chemical Engineering at the University of California at Berkeley from 1942-1943. He served as research associate and assistant director of the bio-organic group of the Radiation Laboratory at the University of California, Berkeley from 1946 – 1954. From 1955 – 1961, he was a professor in the Department of Agriculture and Biological Chemistry at The Pennsylvania State University. He came to Scripps Institution of Oceanography as a professor of biology in 1962 after spending a year as professor-in-residence at the Laboratory of Nuclear Medicine and Radiation Biology at the School of Medicine, University of California, Los Angeles. At Scripps, he has served in a variety of capacities including: chairman Marine Biology Research Division (1965 – 1969), Associate Director of Marine Biology (1966 – 1970); and director, Physiological Research Laboratory (1970 – 1977). He is currently a professor emeritus in biology at Scripps and continues to work at the Alert Bay Laboratory for Marine Biological Research, Alert Bay, British Columbia where he acted as director in 1980. Benson has earned several awards and honors including: the Sugar Research Foundation Award for elucidation of the sequence of intermediates for sucrose synthesis in plants (1950), the Ernest Orlando Lawrence Memorial Award of the Atomic Energy Commission for development of radiotracer methods in biology (1962), and the Stephen Hales Award of the American Society of Plant Physiologists (1972). The interview stressed Benson's many years of research working with several prize-winning and influential scientists from diverse fields and multiple countries. We also discussed his views on scientific discoveries; their dissemination and marketing as well as the impact that Scripps had on his life and work.

INTERVIEW HISTORY: The interview took place on an autumn morning in the Helen Raitt Room at the Scripps Institution of Oceanography Library in La Jolla, California. The interview was conducted on September 26, 2006. We spoke for over two hours with no interruptions.

Laura Harkewicz
Oral Historian, Scripps Institution of Oceanography/UCSD
April 10, 2007

Dr. Andrew Benson with sample of the first radium, 1942.
Scripps Institution of Oceanography Archives, UC San Diego.

INTERVIEW WITH ANDREW BENSON: 26 SEPTEMBER 2006

Harkewicz: All right. It is September 26. We are in the Helen Raitt room at the Scripps Library in La Jolla, California and I am here with Dr. Andrew Benson. Good morning Dr. Benson.

Benson: Good morning to you Laura.

Harkewicz: Thank you.

Benson: I'm glad I got here finally.

Harkewicz: I'm glad you did too.

Harkewicz: So, normally my first question is how you came to Scripps, but through your suggestion I read a few of your other articles[1] that you wrote about your earlier career and I wanted to start us off with a few questions about your childhood. So, I wondered how, or if, your father's occupation as a medical doctor affected your career or choice to go into science?

Benson: Oh, I'm sure it was important. For instance, he had a portable x-ray machine that one can carry around to the patient's home, and with a essentially a scanner or a fluorescent screen you can see the bones and everything, and set the bones right there and then tie it up with some bandage and plaster and the problem is solved.

Harkewicz: So, he took the x-ray machine with him?

Benson: Yes. So, I was working with an x-ray machine for, oh, hours and hours looking at my hands and bones and everybody else's. And, exposure to radiation is nothing to me. And, I've been working with radioactive isotopes ever since.

Harkewicz: You mentioned that you, as a child you had used his fluoroscope and x-ray, portable x-ray machine, to do experiments. Was that what you were talking about, x-raying your hands and such?

Benson: Mostly, just looking at the screen. Well, not pictures, just simple experiments.

Harkewicz: Okay. But I have done some work in nuclear medicine myself and you had mentioned that you felt that low levels of radiation were actually good for you?

Benson: Yeah. It can be good.

Harkewicz: Could you talk about that a little bit?

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[1] Andrew A. Benson, "Following the path of carbon in photosynthesis: a personal story." *Photosynthesis Research* 73 (2002): 29 - 49; A. A. Benson, "Paving the Path." *Annual Review of Plant Biology* 53 (June 2002): 1 – 25.

Benson: There's considerable evidence to justify thinking about that, but I know people on the Committee for Hiroshima and they don't agree with me. There are certain regions in the Ukraine that had rather low doses of fallout from Chernobyl and they have fewer cancers than normal.

Harkewicz: Really? And you think that's related to their exposure from the . . .

Benson: Well, I think so and I have a good friend on the Ukrainian-American Committee and that's where I got the opinion from.

Harkewicz: But, what do you say to people, you know, anti-nuke activists and stuff like that that think any kind of radiation exposure is bad?

Benson: Well, they just never studied anything. I mean, it's hard to argue. It's like faith. You can't argue about it. Faith and reason are two different aspects of the world.

Harkewicz: I don't want to get us off on this track too long but I do have one more question, though, because I was curious. I know that you mentioned in one of your articles that you had a laboratory next to John Gofman when you were at Berkeley?

Benson: Yes.

Harkewicz: And, I know he's done a lot of work in cholesterol but I know that later on he became very antinuclear. And, I wondered how you felt about that having worked with him or having worked in the same laboratory as him?

Benson: Oh, his work did not involve any nuclear stuff. It was ultra centrifuge research and he did a good job with it. One of his successor students is at UCLA and I meet with him regularly. He thought very highly of Gofman and his own professor who was in the same group. I don't know anything about Gofman's antinuclear viewpoint.[2]

Harkewicz: At least you didn't see it when you worked together in the past?

Benson: No. I did not actually work with Gofman.

Harkewicz: I mean, well, in a nearby laboratory.

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[2] John William Gofman (1918 -), professor emeritus of molecular and cell biology at the University of California, Berkeley and lecturer at the University of California School of Medicine, San Francisco. As a graduate student, Gofman co-discovered protactinium-232, uranium-232, protactinium-233, and uranium-233. After completing medical school, he conducted research on coronary artery disease and demonstrated the existence of diverse low-density lipoproteins (LDL) and high-density lipoproteins (HDL). His research contributed to the first studies showing a connection between high LDL levels and increased risk for coronary artery disease. In the early seventies, Gofman and his colleague, Dr. Arthur Tamplin – who had both worked for the Atomic Energy Commission (AEC) – reported that human exposure to radiation was more serious than previously recognized. The AEC refuted their report.

Benson: But, it was right next door and I saw him often.

Harkewicz: I see.

Benson: I knew him, knew everybody. Most of my connections were with John Lawrence.

Harkewicz: With John Lawrence, the brother of Ernest Lawrence, right?[3]

Benson: Yes.

Harkewicz: Did you want to talk about that at all as long as we're . . .

Benson: John Lawrence was a good friend and a strong supporter for me all the time. Even after I left he was very helpful. And, I'm sure he wrote some good letters for me. [*Laugh*]

Harkewicz: Okay. Well, that's always good. I was curious about your mentioning that you were a conscientious objector in World War II. I wonder why you chose to do that?

Benson: I wanted to -- I know why I chose to do it. And, I guess I'm glad I did it but I'm sorry that I had to do it. Because, if I had been permitted to stay working with him Sam Ruben[4] would have earned, or been awarded a Nobel Prize. There's no question about it. All his initial radioisotope work following metabolism in animals, humans, and bacteria, in everything. And, also for discovering long-life radioactive carbon 14.

Harkewicz: Why did you say that he would have earned the Nobel Prize?

Benson: No, I did not say that. I got interested in a project of his. He was concerned about the function of phosgene, a potential war gas. And, he had gone to the Army Proving Grounds in Idaho[5] and learned that the lungs of goats treated with phosgene filled with liquid. This liquid, when injected into other goats, also caused the same problem. So, there's something about the preparation of an

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[3] John Hundale Lawrence (1903 – 1991), professor of medical physics at the University of California, Berkeley, Regent of the University of California from 1970 – 1983; Ernest Orlando Lawrence (1901 – 1958), professor of physics, director of the Radiation Laboratory at the University of California, Berkeley. Ernest O. Lawrence was the inventor of the cyclotron for which he won the 1939 Nobel Prize in Physics.

[4] Sam Ruben (1913 – 1943), assistant professor in chemistry at the University of California, Berkeley, co-discover of the radioactive isotope, carbon-14.

[5] Although Benson noted in the interview that the Army Proving Grounds were located in the state of Idaho, in an earlier article about Ruben's work (see footnote #1, "Following the path" page 35) he had referenced the Dugway Proving Ground, which is located in the state of Utah approximately 85 miles southwest of Salt Lake City. Dugway's mission is to test U.S. and Allied biological and chemical weapons defense systems in an isolated and secure environment. It also serves as a training facility for U.S. Army Reserve and National Guard maneuvers and Air Force flight tests.

antigenic protein in the surface of the lungs which is, to which the goats are obviously allergic. So, their lungs fill up. And if you put that same protein into another goat it's going to do just as well, aside from other local goat problems that I don't understand. So, I was interested in making radioactive phosgene. So, I made the first radioactive phosgene with carbon-11, and you have to have it done in half an hour.

Harkewicz: Because carbon-11 has a half-life of half an hour?

Benson: You have a twenty minute half life.

Harkewicz: All right.

Benson: And, I could do it but I don't think any, there are very few people at that time in history who could have done it, because I was pretty sneaky.

Harkewicz: Okay.

Benson: And, I learned a lot of that from my father, who was a very clever physician and he remembered everything – he never kept an appointment book at all. He just didn't have to. And, going through college he just passed with flying colors in half the time that anybody else would have. There's something about a good memory that makes people successful, and I don't have that great a memory but some people do.

Harkewicz: So, you were saying that …

Benson: So, I was making phosgene and feeding it to rats with Sam Ruben. Well, he was really the power behind it but I was doing all the experiments and making the stuff and he was very enthusiastic about it. And, in doing so I transferred ordinary phosgene from old German ampoules. You know what an ampoule is?

Harkewicz: Yes

Benson: A sealed glass.

Harkewicz: The little tubes. Yes.

Benson: Glass bottle with a sealed tube on it. And then you open that seal and you've got a few cups of phosgene liquid in the bottle. If you cool it down -- the phosgene boils at eight degrees Celsius, and if you cool it down in ice it doesn't run away too badly and you can smell it. So, I did all that transfer of phosgene from the ampoules to a little steel pipe bomb, with a valve so you could turn it on and off, for Sam Ruben. And then, when I left, Sam was trying to do it himself, with one wrist broken in an auto rollover going to his research area in northern California, and he was the impatient type. So, he cooled an ampoule in liquid nitrogen.

Liquid nitrogen boils like crazy if you put something warm into it. And, of course, that cold caused the ancient ampoule to break. I had always done it carefully in ice water so I had no problem. But, when Sam did it, it broke with all this spewing explosion of droplets of phosgene all over Sam's wool sweater and he could not run away from it. And so, he ended up dying like the goats that we had been studying, which is tragic, tragic for science and for his family, and everything else. And, I've spent a lot of time in the last few years with his son, who was only five when Sam died so he didn't remember his father. But talking with George Ruben[6], who is a professor at Dartmouth, it's spooky because his voice is precisely like his father's.

Harkewicz: Really?

Benson: It is.

Harkewicz: That's something.

Benson: It's so amazing to me. Maybe it's true in many families. But . . .

Harkewicz: So, do you feel the fact that you weren't there contributed to his death?

Benson: Yes. So, I regret that. If I hadn't said anything about being a conscientious objector it would have been just fine with everybody, including my draft board.

Harkewicz: But, why did you choose to be a conscientious objector? I know that caused you to have to go work with the Forest Service and on antimalarial drugs and things like that. But., what prompted you to make that choice?

Benson: Well, my father was essentially a Quaker. He didn't go for the nonsense in most ordinary religions. And, the Quaker is essentially conscientious objection. And at Caltech, when I was making this decision, there was a young professor named Bob Emerson. A great, great, great grandnephew of Ralph Waldo's brother, or something like that.[7]

Harkewicz: Really?

Benson: But, he was a classy gentleman and at noon we'd go out on the playing field, a group of us, maybe twenty, would talk with Bob and he was very supportive. He was the one that revolutionized the mechanism of photosynthesis light reaction.

Harkewicz: I see.

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[6] George Ruben (1941 -), research professor, Department of Biological Science, Dartmouth College.

[7] Robert Emerson (1903 – 1959), professor of biology at California Institute of Technology. Emerson was great-grandson of the older brother of American essayist, poet, philosopher, and leader of the Transcendentalist Movement, Ralph Waldo Emerson (1803 – 1882). Robert Emerson's father was public health pioneer, Haven Emerson (1879 – 1957).

Benson: He became, after that, a very famous man that turned the course of thinking about light reactions in photosynthesis. That's not the kind of photosynthesis I was doing, but that's all right. But so, Bob Emerson was a strong influence. Everybody has a very high regard for Bob Emerson and it helps my case.

Harkewicz: So, your conversations with him encouraged you to become a conscientious objector?

Benson: He was very encouraging.

Harkewicz: I understand that you mentioned in one of your pieces that your work in the Chemistry Department in Berkeley was problematic because of your conscientious objector status. But, I think, if I understand this right, it's because of some of the work that they were doing. I was also wondering if the fact that you were a conscientious objector in World War II affected your work at all when you came here to Scripps and they had military patronage?

Benson: No. No. We had a lot of restricted information in the Radiation Lab. I was just in part of it and there was no, nothing.

Harkewicz: It was nothing to do with working for the military or anything like that?

Benson: Except I was interviewed several times and I didn't like that. But . . .

Harkewicz: Because of your conscientious objector status?

Benson: Yes, they were trying to nail me and they'd just made me sore.

Harkewicz: Do you think it's affected you at all? I'll let this go but I mean . . . .

Benson: Not really. Except I regret now that not having been able to save Sam Ruben

Harkewicz: I understand.

Benson: Because I thought the world of him and I think everybody else did too.

Harkewicz: You wrote all these pieces about the path of carbon in photosynthesis[8] and I wonder how that affected your oceanography work, if it had any effect on it?

Benson: No, that's a . . .

Harkewicz: It's a totally different subject?

[8] See footnote #1 for citations of articles.

Benson: Oh no. Oh, everything's related. It's just plain old chemistry. It's one way or the other. You know, I was on the faculty of chemistry at Berkeley, which is a great opportunity. If you read the first paragraphs in that article I wrote, Linus Pauling and Wendell Latimer[9] engineered this on their own. And so, after Pauling asked me this question[10], which was, had nothing to do with my thesis, and I gave a decent answer. Two weeks later I got a letter offering me a position in the chemistry department.

Harkewicz: At?

Benson: Berkeley. Which was as good as you can get.

Harkewicz: So, you could think on your feet then?

Benson: Yes.

Harkewicz: Or make connections where maybe connections weren't obvious?

Benson: Well no, we'd learned that, I'd learned that stuff in Berkeley as an undergraduate. But, in Caltech it was never mentioned because there was no isotope research going on there. A lot of nuclear physics but not radioisotope stuff.

Harkewicz: So, you had what they wanted then at Berkeley?

Benson: No, it's more that I had what they needed. I was an organic chemist and Sam Ruben and Martin Kamen[11] are physical chemists and they understand the physics better than I. But, Sam was a plumber too and he could make anything go, and he didn't mind getting dirty. And, there's a classic photograph of him and Martin Kamen was wearing the grungiest old dirty, greasy lab coat you could imagine. But, he was also a heck of a good chemist. And, he appreciated my kind of chemistry too.

Harkewicz: Have you found similar appreciation here at Scripps between people in different disciplines?

Benson: Oh, I think so. Well, here at Scripps, I was firmly influenced by Pete Scholander[12]. That guy was a genius with a grin. [*Laughter*]

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[9] Wendell Latimer (1893 – 1955), professor of chemistry at the University of California, Berkeley. Latimer was also dean of the College of Chemistry at UC, Berkeley from 1941 – 1949. Linus Pauling (1901 – 1994), quantum chemist and biochemist and professor of chemistry at the California Institute of Technology. Pauling won the Nobel Prize in chemistry in 1954 for work describing the nature of chemical bonds. He also won the Nobel Peace Prize in 1963 for his campaign against nuclear weapons testing.

[10] The question Pauling asked Benson was, "Andy, can you write on the board the differential equation for decay of a radioactive isotope?" See footnote #1, "Paving the Path," page 2.

[11] Martin Kamen (1913 – 2002), chemist at the University of California, Berkeley and co-discoverer of the radioisotope carbon-14.

[12] Per Fredrick Scholander (1905 – 1980), professor of physiology at Scripps.

Harkewicz: I like that. "Genius with a grin." Well, let's back up a minute here and tell me how you came to Scripps then?

Benson: Well, that was a long trip. Essentially, I got fired at Berkeley by Melvin Calvin[13] and now that I've thought about it for what, twenty, forty years, I realized what was going on. Melvin Calvin had a remarkable memory. Anything that anybody told him he remembered every bit of it, very well, and he presented it very well in his lectures at meetings and things. He did a good job. He sort of bumbled off at the beginning but then he worked up into a crescendo and nailed the subject. So, when he finished one lecture on his theory of – it was often an ill-fated theory that died a slow death, but he presented it so elegantly that C.B. Van Niel[14], a god in bacterial metabolism at Pacific Grove, just stood up with tears in his eyes he congratulated Melvin Calvin for solving every problem in photosynthesis.

Harkewicz: Really?

Benson: Yes. And, the problem, every bit of evidence for his theory fell apart. But, that's another point.

Harkewicz: But, how did that relate to your getting here?

Benson: I got a good idea of what was going on at Caltech, because my wife was from Pasadena. And, I knew how to get the enzyme for fixing carbon dioxide from air to make sugar. And so, I and a Belgian visiting professor worked like crazy to isolate the enzyme that was doing it. And I didn't, at that time Melvin Calvin was interested in his Thioctic Acid Theory that ultimately failed but he was putting all his efforts on that and so we were working like beavers for maybe six months, day and night. Because everything we do has to be a twenty-four hour operation. And . . .

Harkewicz: So, was the work you were doing . . .

Benson: I wasn't telling Melvin about it.

Harkewicz: Was it in competition with him?

Benson: No. Totally independent. I was not obligated in any way.

Harkewicz: Okay.

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[13] Melvin Calvin (1911 – 1997), director of the University of California Radiation Laboratory at UC Berkeley from 1946 – 1957. Calvin won the Nobel Prize in 1961 for his work delineating the path of carbon photosynthesis.
[14] Cornelius P. Van Niel (1897 – 1985), pioneer of general microbiology and educator at the Jacques Loeb Laboratory of the Hopkins Marine Station belonging to Stanford University and located on the Monterey Peninsula in Northern California.

Benson: Because he didn't know about it. And, as a matter of fact, when I wrote up the paper and I felt obligated to have to give it to him, and he was supposed to pass it on to a committee or something, but apparently he didn't understand it at all, and he didn't realize what it was about. And, here I was, I discovered that the enzyme that fixes the CO_2 in photosynthesis is exactly the same as the main protein in leaves. And, the main protein in leaves was discovered by a good friend at Caltech. And, when this dawned on me I figured that was my greatest discovery of all, and then it got trashed in the bin, actually.

Harkewicz: Because?

Benson: It got published. A paper came out two years later from the lab but it didn't reveal the relationship that I and Jacques Mayaudon[15] had discovered.

Harkewicz: Because you gave it to Calvin and he didn't understand it?

Benson: He didn't understand it. I thought, I had given all the references, everything. It was – I typed it myself, and I don't have any copies. You know, when you have to type four carbons on your own little machine, and there weren't Xeroxes and things like that. Anyway. That was a . . .

Harkewicz: So, were you frustrated with that situation and so you came here?

Benson: Oh no. Not to Scripps or anywhere. He said that it's time to go clearly because I wasn't telling him anything.

Harkewicz: Oh, I see.

Benson: And, if everybody in the lab weren't telling him anything he'd be high and dry.

Harkewicz: I see. That seems like a pretty big discovery. What happened to it later?

Benson: Well, it got published by my colleague.

Harkewicz: The Belgian?

Benson: My Belgian colleague.

Harkewicz: And what was his name?

Benson: His name was Mayaudon. M-A-Y-A-U-D-O-N. A wonderful guy. We just worked together like clockwork. It was great. But, but a paper finally, three years later, was submitted to an esoteric scientific journal, *Enzymologia*, in Austria or someplace and it should have had my name on it anyhow, and Jacques

[15] Jacques Mayaudon (1921 -), bio-organic chemist.

didn't recall how it got to the editor or anything.[16] It must have been submitted to the editor through Calvin's office.

Harkewicz: Really? The person that didn't understand what you were talking about and thought you had nothing to offer presented your paper to . . .

Benson: Yes. Oh yes. After that, no publication included my name. And here it is. He'd never done a radioactive carbon fixation or a paper chromatogram in his life.

Harkewicz: So, how do you feel about that, I mean, all these years later?

Benson: Well, I used to put up with it and everybody in the lab was very enthusiastic about the way he was managing things. He got the money, which could make things go. And, I designed the lab and everything and was working just fine.

Harkewicz: So, you came to Scripps with this background?

Benson: No, then I had to get a job.

Harkewicz: Okay.

Benson: And, Melvin Calvin did not help me get a job at all, but my brother-in-law did at Penn State[17]. He was the chairman of Geophysics. So, I worked at Penn State, which turned out to be really good for me because we had some good students and outstanding postdoctoral colleagues, and we made one discovery after another. I will say, all we did was make discoveries. We didn't piddle around with them after that. You let the poor folks pick up the crumbs.

Harkewicz: Let's see. You were at Penn State for, . . .

Benson: I think six years or seven.

Harkewicz: And, you were an associate professor there then?

Benson: Yes, but I advanced to a professor. They tried to get me to stay but it was a salary of $11,000. It's kind of hard with a family of four kids and an expensive house. We built the best house in the State College, with help from a Berkeley architect friend.

Harkewicz: I suppose in comparison to residences in California though it was probably a good deal?

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[16] J. Mayaudon, "Study of association between the main nucleoprotein of green leaves and carboxydismutase." *Enzymologia* 18 (1957): 345 – 54.

[17] Benjamin Franklin Howell (1917 -), professor of geophysics at Penn State.

Benson: Well, we sold it for $48,000 and we should have gotten a lot more. We'd get much more for it now, of course.

Harkewicz: This was in the early sixties then, right?

Benson: Yes, 1961.

Harkewicz: So then after Penn State you went to UCLA, right?

Benson: Yes, the UCLA School of Medicine in the Departments Nuclear Medicine and Physiology.

Harkewicz: And so again, I'm trying to find out how you got here though. I see this is all a trail. So . . .

Benson: We had three daughters and one son, and the son died in an unfortunate drowning accident and that was sort of, you know, you don't want to stick around. And . . .

Harkewicz: This was in Pennsylvania then or in Los Angeles?

Benson: This was L.A.

Harkewicz: Okay.

Benson: We lived in a house that it was originally Amos' house, of Amos and Andy[18].

Harkewicz: Oh really?

Benson: Yes. It was a nice house. It was just ordinary. It wasn't expensive. And so, we had an offer by Francis Haxo[19], who was the chairman of Marine Biology, and an offer at UCLA, and I chose the one to go to Scripps.

Harkewicz: Why was that? Because you wanted to get out of Los Angeles because of your son?

Benson: Yes. Well, I had been invited to go on a Scripps cruise back in, oh, 1954 or something like that. We were going to fix radioactive CO_2 by marine phytoplankton. And, we went out on this little old Scripps boat. It wasn't little exactly but not one of the big ones they have now. And, with Bill Thomas[20], was one of them. Maybe you know him? He was with Scripps for a long time. He's now an expert on algae that grow in the snow in the Sierras.

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[18] The television show, *Amos and Andy*, ran from 1951 – 1953. It starred African-American actors in roles that had been originated on radio by the white performers, Freeman Gosden and Charles Correll. The television role of Amos was played by Alvin Childress (1907 – 1986).
[19] Francis T. Haxo (1921 -), professor of biology at Scripps.
[20] William Hewitt Thomas (1926 -), emeritus research biologist at Scripps.

Harkewicz: Really?

Benson: Some red algae. I don't know. Anyway, we've always had good collaborators. And then I got enthusiastic, or enthusiasm built by knowing Pete Scholander. I got interested in mangroves. You know about the mangroves?

Harkewicz: No. Tell me about them.

Benson: Anyway, we went down in Baja, California on one of the Scripps boats and the boat just arrived and Pete jumped off into a little outboard boat in the dark and he grabbed some mangroves in the dark and came back to the ship and started experiments. [*Laugh*]

Harkewicz: Really? In the dark even?

Benson: And so he was wondering how the mangroves could exude salt. They all have their little kidneys to pump the salt that gets into their roots and pump it out through the leaves. So, I was growing mangroves in the lab and they looked like little snow drifts of salt on the surface of the leaves. It was beautiful.

Harkewicz: Really?

Benson: Yeah. But, I didn't want to have to go down there to grow the mangroves so I tried growing them in Mission Bay. And that was, I had all the support of Carl Hubbs, Judith Munk, and Judith Munk's mother, and her grandmother who was Mrs. Horton, and they were all cheering for it[21].

Harkewicz: Did it work?

Benson: Oh, yes. There were some cold winters. We even had a little snow. And, I had heaters out, you know, heating, heat bulbs to keep them happy on cold nights.

Harkewicz: This is out in the bay you're talking about?

Benson: Yes.

Harkewicz: Okay.

Benson: Well, at the university preserve now. And, finally they started growing just fine and they took care of themselves. And, Carl Hubbs was thrilled because it would

[21] Carl Leavitt Hubbs (1894 – 1979), ichthyologist at Scripps; Judith Horton Munk (1925 – 2006), artist and architect who married Scripps physical oceanographer, Walter Heinrich Munk (1917 -) in 1953. Judith Munk's mother was Edith Kendall Horton. Her Kendall grandmother owned property in Mission Bay which was later given to the University and became the Kendall-Frost Mission Bay Marsh Reserve. Her other grandmother was Lydia Knapp Horton (1843-1926), widow of Alonzo Erastus Horton (1813-1909), called the father of San Diego.

give some protection for the birds and keep the wild dogs from chasing them. And, everybody was enthusiastic because it was keeping the tidal channels from eroding and spreading. But, the little mangrove trees were just happy. And, in one place they got up to ten feet high. And then Paul Dayton[22] came around and these ecologists decided that they were an unnatural thing, and this was the most sinful thing that could have been done to San Diego. And they uprooted I think 13,000 mangroves.

Harkewicz: So, this was relatively recently that they did that?

Benson: Well, that was fifteen years ago. Everything's relative.

Harkewicz: Right. But, when you were working with the mangroves and planting them. That was in the sixties?

Benson: Probably sixty-five.

Harkewicz: Okay. So, they were out there for quite a while then?

Benson: Oh yeah, for maybe eight or ten years. And, you know, I got so busy with sixteen other projects that I didn't go out and nurse them. But, it's the only mangrove that makes something that looks like a seed. It looks like an almond looks on a tree, about that size. And, it has a hull, an outer skin. And, as soon as it falls in seawater the skin comes off and its two seed leaves open up like that and a little root goes down in a few minutes and grabs onto the mud, and a little shoot starts coming up from the middle, and away it's off. And, those things are like a great big lima bean, and dark green. So, I figured it ought to be edible. If you tried eating them it tastes bitter just like an acorn. It's just a tannin. And so, being a chemist I extracted the tannin just like the Indians used to get it out of the acorn, ground up acorns, and it works just fine, and they taste good. And so, I figured they could feed a lot of people with it. And, in the last twenty years Gordon Sato[23] – I don't know, do you know that name?

Harkewicz: No, I don't.

Benson: He was the founder of the nude mouse colony that made cancer research possible in our biology department, on the hill. And, Gordon Sato is a Caltech PhD, and a brilliant cell biologist, one of the great ones. And, he sort of retired as a cell biologist and went to Eritrea to do something for the poor people of Eritrea who had been fighting a war for twenty-five years against the communists in Ethiopia. And, he called me to find out about how to grow mangroves.

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[22] Paul Kuykendall Dayton (1941 -), professor of oceanography at Scripps.

[23] Gordon Higashi Sato (1927 -), American cell biologist and professor of biology at UCSD from 1970 – 1983. Sato established the Manzanar Project in the 1980's, which is aimed at attacking global problems such as hunger, poverty, environmental pollution, and global warming through low-tech biotechnology. He currently works full-time for the Project.

Harkewicz: Really?

Benson: So, so now he's been growing like 600,000 mangroves on the sandy shores of the Red Sea, close to Eritrea, and he developed some tricks for fertilizing them, and sort of measured them out by having some pinholes in a plastic bag alongside the roots and a piece of iron to provide the iron, or rust, to provide the iron for the plants. And, he's done a good job and he's had a lot of honorable awards, like the Rolex Award of $100,000 for innovation[24].

Harkewicz: It's great that your work could help?

Benson: Oh yes.

Harkewicz: Is that the kind of work that you did when you first came to Scripps then, working with Scholander on the mangroves?

Benson: Oh no, that was just a . . .

Harkewicz: A side project?

Benson: Yeah. Just fun.

Harkewicz: So, what did you, when you came here, what department were you hired into?

Benson: Oh, Marine Biology.

Harkewicz: Marine Biology?

Benson: Yes. And, Francis Haxo is a very famous guy, in case you don't know. He discovered one of the important pigments in algae.

Harkewicz: Okay.

Benson: He had outstanding training at Stanford, Pacific Grove. My other best friend is Gérard Milhaud, M-I-L-H-A-U-D, who I think I first met in 1951 when we spent a year in Norway. But, he had just received his M.D. and Ph.D. in organic chemistry, and he was working in the Pasteur Institute. And, he had spent almost a year in our lab in Berkeley so he returned to the Pasteur Institute and did the same thing with chemoautotrophic bacteria that all fix carbon dioxide just exactly like live plants do. So, he discovered that. But, if you go under the Arc de

[24] The Rolex Awards for Enterprise were initiated in 1976 to commemorate the 50th anniversary of the Rolex company's greatest technical achievement – the waterproof Oyster chronometer. The Awards were established to recognize the innovative thought and pioneering spirit of individuals by giving winning applicants, through the monetary award, the means to implement original projects. The $100,000 Awards support creative projects in science and medicine, technology, exploration, and the environment. Five "Laureates" are awarded annually.

Triomphe in Paris there's a big marble plaque of a whole bunch of like twenty names and one of them is Haxo, who was a general, an engineer for Napoleon; and Milhaud who was leader of the horsemen that went up the mountain in Waterloo. So they're . . .

Harkewicz: And they're related to them?

Benson: Oh, they communicate with Napoleon, with himself. That's a special corner of history.

Harkewicz: So . . .

Benson: So, I had been working with Gérard Milhaud since sixty-eight, with calcitonin in salmon.

Harkewicz: And, I'm sorry, is he still at the Pasteur, or is he here?

Benson: Now, he's actually a member of the 130 member of the National Academy of Medicine of France. And so, he communicates with Chirac, personally[25]. Chirac gave him all kinds of big honors. He's in the top counsel of the Academy of Medicine, which is a huge honor. He discovered, or was the first one to utilize calcitonin in treating osteoporosis in 1964. And, so he's still top man in that field. And, he and I feel that Fosamax, which is a diphosphonate, is such a toxic looking molecule and totally unnatural, and it's being sold for great profit by drug companies, when they should be using calcitonin, which is not advertised much.[26] But, it has been very helpful with people I know, like Bob Peterson,[27] in strengthening their bones. Bob's dentist was absolutely amazed that his teeth were no longer rattling around in his jaw.

Harkewicz: But maybe you can talk a little bit about why you think Fosamax is so popular and why nobody knows about calcitonin?

Benson: Well, they advertise it on the TV every twenty minutes. The medics don't hear about calcitonin.

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[25] Jacques René Chirac (1932 -), President of the French Republic at the time of this interview.

[26] Fosamax is the brand name for the generic alendronate, which is a group of medicines known as biphosphonates. It alters the cycle of bone formation and breakdown in the body and is used to treat post-menopausal osteoporosis and steroid-induced osteoporosis. Calcitonin is a 32-amino acid polypeptide hormone that is produced by the C cells of the thyroid. Calcitonin participates in calcium and phosphorus metabolism.

[27] Robert Oscar Peterson (1916 – 1994) founded the restaurant, *Jack in the Box*, in San Diego in 1951. In 1968, Ralston Purina Co. acquired controlling interest of the company, which was bought by an investment group that included members of the company management in 1985. Peterson was a member of the Scripps Institution of Oceanography Director's Marine Research Foundation where he provided financial support for Benson's research on salmon and on coral metabolism on the Clarion and Socorro Islands of the Revillagigedos located 350 miles southwest of Cabo San Lucas, Mexico.

Harkewicz: But some scientist somewhere must have developed Fosamax somewhere along the line.

Benson: We know those guys too.

Harkewicz: Okay.

Benson: One of them was at UCLA when I was in nuclear medicine there, and Gérard visited him. And, it's just a scary looking molecule.

Harkewicz: Well, I'm sensing a pattern here though, because when you were younger you had this great discovery about photosynthesis and it got lost somewhere in transit. And now there's this whole thing with calcitonin and people don't know about that?

Benson: Yes, but it, but it does. It does help everybody. It's just that it's not widely utilized by the medical profession because they're influenced by the drug salesmen.

Harkewicz: So, you think the problem is with drug marketing companies?

Benson: Yes.

Harkewicz: Do you see any, as a scientist do you see any recourse for that?

Benson: No. Calcitonin is, you get it at the clinic, and they use a technique for delivering it by inhaling through one nostril at a time.

Harkewicz: So, it's not a pill. You inhale it?

Benson: You have to get it into the blood somehow.

Harkewicz: I see.

Benson: And, originally it was in little ampoules and Bob Peterson would inject it, and Gerard would send him case after case of it. And, Bob didn't mind that. But, most people don't like injections. So, one of my students, John Patton,[28] developed a company based upon the fact that you could inhale a dust, a dry dust of calcitonin, or a dry dust of insulin, and it goes all the way into the alveoli in the lungs and instantly into the blood.

Harkewicz: So, with the insulin that would replace injections for diabetics then?

Benson: Yes.

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[28] John Stuart Patton (1946 -), founder and vice-president of Research Inhale, Inc. Patton received his Ph.D. in marine biology from Scripps.

Harkewicz: And, what's happened with that kind of thing?

Benson: Gérard says the insulin is too risky because some diabetics are on tenterhooks balancing the amount of insulin.

Harkewicz: So, it wouldn't be as . . . .

Benson: And for calcitonin it's no problem and it would be so much easier and cheaper inhaling the calcitonin. The nice thing about that kind of thing, a protein like insulin, or a peptide, that is completely stable, dry at room temperature and it doesn't have to be kept in a fridge or anything. That simplifies a lot.

Harkewicz: But, your student who started this company has he been successful with this?

Benson: Very. That was just approved by FDA, and it's a big thing. And, you know, Pfizer takes over and collects all the money.

Harkewicz: So, are you expecting to see commercials for it?

Benson: I won't. I won't. But, don't worry; Kirk Gardner[29] is after them for supporting Scripps students.

Harkewicz: Okay.

Benson: He's been communicating up there with both of my colleagues. They're both – Barry Holtz is a brilliant engineer and biochemist. And, he wasn't a student, but he was a postdoc in my lab. But, he's as smart as they come and he's doing some fantastic stuff right now synthesizing essential enzymes that solve the most gruesome hereditary diseases.

Harkewicz: You said that his name is Barry Holtz?

Benson: Yeah.

Harkewicz: Okay. Well, we've talked about people from all different places - I just wonder how you feel Scripps relates, how it compares to some of your other experiences or experiences of your colleagues?

Benson: When my colleague at UCLA, Judd Nevenzel, was interested in lantern fish, that go down a thousand feet in the daytime and come up at night, and we were wondering how in the devil they could do all that up and down work. Judd showed that they had a lot of wax ester. If you know what wax ester is? It looks like olive oil but it's not, not like a fat. It's more like ethyl acetate, which is what nail polish remover is.

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[29] Kirk Gardner (1941-), Scripps Director of Major Gifts and then Senior Development Officer from 1998- 2007.

Harkewicz: And they use that as an energy?

Benson: If you make it longer and longer is a wax. And if they make it twice as long as that you got bee's wax, which is no longer liquid or very soluble. So, with Dick Lee[30] in my lab, who is a really brilliant guy, as a student he got interested in this and covered the whole ocean looking for where wax was functioning. And it turns out . . .

Harkewicz: So, he looked for the wax in the fish?

Benson: Yeah.

Harkewicz: Okay.

Benson: And we were thinking about, "How come everything in the mid ocean is loaded with wax and everything sitting on the bottom of the ocean doesn't have any wax?" So, we spent a lot of time in British Columbia waters collecting copepods, which Judd Nevenzel, and Dick Lee had shown are loaded with wax. The copepods there, seventy percent of their dry weight is liquid wax. It's like a little tank truck, oil tank truck. They're up there eating algae when the water looks like tea because there are so many diatoms in it. And, when they get all loaded up, they go down to the bottom. It's only three hundred feet at that part. But, they go down to the bottom and find a mate and lay eggs. And, the little – there's a dozen stages of development before they're the last stage. And at the last stage they're back up at the surface again to eat, to live on the diatoms that are fed by the new water coming down from the glaciers and the rivers.

Harkewicz: And so, where is the wax coming from? When they lay their eggs?

Benson: Well, no the wax is made from the fats of the diatoms.

Harkewicz: I guess I'm not following where the wax is coming from in the ocean. You said there is wax all over the, in the food chain.

Benson: It's not all over the ocean. It's in all of the creatures in the mid ocean.

Harkewicz: Oh, in the creatures in the mid-ocean. All right.

Benson: And, they know how to make it. And, the reason they make it is that wax is "Nature's Starvation Insurance." Who knows in the dark when they're going to find a mate or when they're going to find somebody to eat. And so they can live ten times longer.[31]

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[30] Richard Fayao Lee (1941 -), research professor of oceanography at Skidaway Institute of Oceanography.
[31] Benson later noted that the "they" that he was referring to were "the copepods in the Strait of Georgia."

Harkewicz: So, they know that they have to go down in order to mate and . . .

Benson: Of course. They, and all the shrimp and the little fishes in that five to ten thousand feet down are loaded with wax. And, they wouldn't survive very long if they used fat.

Harkewicz: Because it doesn't last that long, or . . .

Benson: Because our enzymes would hydrolyze or utilize the fat, and bingo. Whereas wax, it takes their, their enzymes and our enzymes are ten times slower in taking the wax apart. But, they can eek out an existence.

Harkewicz: Could that be useful in humans? Can you visualize or imagine that humans could use wax in some way?

Benson: Well, you remember buying orange roughy fillets in the meat market?

Harkewicz: Yes.

Benson: If you take an orange roughy on the grill and you eat the whole fish, you'll get diarrhea right away, because their skin and bones are loaded with wax. But, the muscle is not. So, that's why they sell the muscle.

Harkewicz: Okay. So, you started telling me this story though about different groups at Scripps interacting, and so . . .

Benson: Well, in this case Dick Lee was interacting with all the phytoplankton guys, and the oceanographers who know where they are. And, the polar algologists like Ozzie Holm-Hansen who knows what algae are growing in the Antarctic and the Arctic. So, it's really a cross-the-board stuff and it involved the movement of water masses.

Harkewicz: So, you think that physical oceanographers and biological oceanographers are interacting as well?

Benson: Yes.

Harkewicz: Have you felt that's always been the case? I know there were certain times in Scripps' past where it seemed like oceanography was more powerful, for lack of a better word, than biological oceanography? Did you ever experience that or did you ever see it?

Benson: Oh no. There's an awful lot of important work on, in exploring relationships with physical oceanographers. There's no question about that. In wave mechanics and stuff like that. It's over my head, but Walter Munk[32] is the Chief . . .

Harkewicz: But, did you ever feel like it affected your work at all, like maybe you didn't get funding because it went somewhere else?

Benson: Oh yes. We, well we don't get funding because it goes to the space, space modules, and talking about going to Mars and stuff like that, which is hardly a good investment for humans. It's too dangerous. The radiation getting to Mars would be unbearable. Nobody wants to take a chance like that.

Harkewicz: So, it's not just . . .

Benson: The cosmic radiation is ungodly.

Harkewicz: It's not just the cost? You're talking about actual health risks then?

Benson: Yes. But, some of this money is going into space experiments. I was on a space biology panel for a long time, and the experiments are kind of interesting about tropism, about how the root knows which way is up and down. But, I don't see any big agricultural – the real exciting stuff is the fact that these long-chain polyunsaturated fats of algae seaweeds are so important for our health. And just in the last three years the breakthrough has begun. A friend in Hamburg, Germany, who I've known since he was a graduate student in Köln, and two groups working in England, have transferred the genes for the enzymes that convert ordinary fatty acids to the long-chain polyunsaturated ones. So, they've got all of these put together and they transfer them to soybeans, and wheat, and rice, and corn. And, when that gets, you know, developed agronomically it's going to just revolutionize nutrition for the world, for the underprivileged world, and it will relax the pressure on the ocean over fishing.

Harkewicz: Let me ask you something there though. Because before you were talking about the mangroves that Paul Dayton and people like him pulled up because they weren't natural, but there . . .

Benson: He didn't ask me how to pull them up. All you have to do is take a snipper and just cut them off. And, they, they're living on the edge of possibility anyhow. And, if you just cut them off they're dead in the water. And, Paul Dayton and his crew could have saved a lot of money and time.

Harkewicz: So, they didn't do it that way?

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[32] Walter Heinrich Munk (1917 -), physical oceanographer at SIO and professor of geophysics at UCSD.

Benson: No, they didn't know. They didn't ask me.

Harkewicz: That was an area where you didn't interact with another oceanographer then?

Benson: Yes and no. Paul Dayton's a wonderful guy. There's no question about that.

Harkewicz: But, what I was getting at is that what you're talking about with the polyunsaturated genomics would be like gene altering and there are some people that are against that as . . .

Benson: They'll get over it.

Harkewicz: They'll get over it?

Benson: If they got something to eat and if it improves their health then they'll feel better about it. But that's the biggest development in the last few years, as far as I'm concerned, until the last few weeks when they started talking about ascorbic acid in tumors.

Harkewicz Is that something you're working on right now then?

Benson: Yes. Yes. Well, I started it twenty-five years ago but right now it's being publicized by – Well it's, well, that's getting way ahead of you.

Harkewicz: No, well, since you brought that up though, isn't that the kind of thing that Linus Pauling was suggesting years ago with taking Vitamin C as . . . [33]

Benson: Yeah. He was my teacher.

Harkewicz: Yes. I know. You mentioned that. So are you going to confirm what he had suggested?

Benson: No. He didn't really try it. He was taking it in his stomach and that's hard on the lining of your stomach, but it doesn't get into the blood.

Harkewicz: So, this is like calcitonin? It has to get into the blood?

Benson: Yeah. And, a guy at the National Cancer Institute had bravely been injecting intravenously 30g of Vitamin C twice a week. Which is like . . .

Harkewicz: Into himself?

Benson: Which is like a sledge hammer.

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[33] In the 1970's, Linus Pauling suggested that high doses of Vitamin C could prevent the common cold as well as help prevent the onset of cardiovascular disease. He also claimed that megadoses of the vitamin, as a supplement to normal therapies, could extend the lives of cancer patients.

Harkewicz: He's doing it to himself then?

Benson: No. Cancer patients.

Harkewicz: Okay.

Benson: And their tumors have disappeared. But, I don't know how many he's tried where the tumors have not disappeared.

Harkewicz: Okay.

Benson: But the trouble is, when you get patients like that, statistics don't mean much because you don't know what the treatment is and what the person's susceptibilities are. And, that was the same with the development that I urged my tumor-doctor friend in Japan to try. He was feeding tumors with benzaldehyde, which had some interesting effects. It's a good reducing agent but it gets oxidized easily. So, he tried to stabilize it by making benzylideneglucose. He just glued the benzaldehyde to the glucose and he was delivering that intravenously and the tumors were shrinking. But then I said, "Dr. Kochi we're all loaded with glucose. Try benzylidene ascorbate. It should be better." And it was, it turned out to be ten times better. So he, Dr. Kochi,[34] showed me scans of twenty different tumor patients, or tumors of twenty different kinds of problems at zero, one, and two months with benzylidene ascorbate and in every case of those twenty the brain tumor, lung, and kidney, and bladder tumors, and bone problems were shrinking down to nothing. But, whether they shrunk enough to really kill the tumor I don't know. But, a lot of them have survived for a long time.

Harkewicz: So, when you said you suggested to this Dr. Kochi that he should try something else, is this more just like an informal type thing?

Benson: Yes. Oh yes.

Harkewicz: You were just talking with him and you say, "Why don't you try . . ."

Benson: Well, it's not – and he always wanted me to help him get it published in the *National Cancer Journal* of the NCI, or *Science* or *Nature*. And, when you got a far out thing like that, *Science* and *Nature* aren't going to accept it very freely. And so, that never paid off, but he's got some minor publication. But, he wasn't a bad scientist. He was invited, when he was a young guy, to Rutgers University, by Selman Waksman[35]. Have you heard of Waksman? He invented the first antibiotic for taking care of tuberculosis. And, Kochi's father had a 200-bed tuberculosis hospital so it became a tumor hospital. And . . .

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[34] Matsuyuki Kochi.

[35] Selman Abraham Waksman (1888 – 1973), microbiologist, winner of Nobel Prize for physiology or medicine in 1952 for discovery of streptomycin – the first antibiotic for treating tuberculosis.

Harkewicz: So, you said, journals like *Science* and *Nature*, they're not going to print stuff about like cutting-edge type things? It has to be more consensus type science?

Benson: Yes. Well, that was my feeling. I wasn't capable of writing a properly structured article with his data and he didn't have anybody else who would do it. And the medical profession in Japan didn't like his point of view anyhow.

Harkewicz: So does this, is this idea that you can't get somebody to print what you're finding similar to your experience when you were in . . .

Benson: No. Well, we never had any . . .

Harkewicz: Calvin's lab or anything?

Benson: We never had any problem. Not a serious problem.

Harkewicz: You don't feel that you had any difficulties publishing your findings in any kind of journal?

Benson: No. We usually made pretty good discoveries.

Harkewicz: What do you mean by "made good discoveries"?

Benson: Well, phosotidalglycerol, you've never heard of it, but you've of Lecithin?

Harkewicz: Yes.

Benson: Which comes from the Greek "lekithos" for "egg"? So, an egg yolk is loaded with a detergent which we call phosotidalchlorine, and people buy choline just to spend money on pills, but it turns out that all my radioactive plants were making some unusual spot right in the middle of my chromatogram and it channelized me so I went to work on it. And, it turned out to be two glycerols tied together with a phosphate. And, that smells like a phospholipid. So, we discovered phosotidalglycerol, which is like phosotidalchlorine only it's got a glycerol instead of a choline or ethanolamine or something else. And so, it was a new lipid, a major one that nobody had seen. It's like you missed the forest for the trees, or vice versa. I don't know which it is. They hadn't been looking for it, but it was there and too simple to – so that's kind of exciting to discover a major phosphor-lipid.

Harkewicz: Well, you had said about Sam Ruben and Martin Kamen in one of your pieces about them inventing C-14 rather than discovering it. So, that almost sounds to me like what you were just describing is almost more inventing than discovering. Would you say that that's true?

Benson: Well, mine wasn't inventing. But, their theory said it should be possible, on-the-edge possible, by the physicists who understand the probabilities of some isotope having an isomer that could be radioactive. I think they tried a dozen different ways to get the cyclotron to produce some long-term stuff that could be identified as carbon, and they finally did but it wasn't easy.

Harkewicz: But, I was wondering how much science you think is inventing versus discovering? Do you feel like it's basically discovering or do you feel like it's making things? Because, I don't know, you're looking for them and you're . . .

Benson: Well, discovering – like when Jacques Mayaudon and I isolated the enzyme from plants that fixes carbon dioxide, and realizing that it's the way we fractionated it and the way it was behaving was exactly like Sam Wildman[36] at Caltech had observed with the main protein in leaves, that's a discovery. They are identical. You wouldn't call it an invention. But, Ruben and Kamen were looking in half a dozen ways, at half a dozen nuclear reactions that you could do with a cyclotron and carbon, or C-13 or something like that.

Harkewicz: So their discovery was more like coming upon something as opposed to. . .

Benson: All of a sudden you realize that through, if Melvin Calvin was right about the thioctic acid that would be a . . . a discovery, I guess. But, the reasons for demonstrating that discovery, or the experiments to demonstrate it all folded up. Everybody in the lab had realized that it was a fizzle, but he still published it, and presented it in lectures.

Harkewicz: Was that because of the status that he had that he was able to do that?

Benson: Oh, he could do that because of his status as a good speaker and he was well known. And, he put on a good show with it, but it was dishonest I think. I never have felt that until recently. If you look at his, he wrote an autobiography with a marvelous title, *Following the Trail of Light.*[37] It's superb. It describes his interests over a long period, but it doesn't mention anybody who did the experiments, such as me. [*Laugh*]

Harkewicz: I see. Have you encountered that in other places or people in your past after him, or in your time at Scripps, you know, people that maybe didn't really have good science but they had some sort of status so that . . .

Benson: I had a postdoc here at Scripps who discovered, or was working on cold tolerance in plants and he made a lot of discoveries and he was a totally honest scientist doing good work. And there was another guy, who I had not known personally,

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[36] Samuel Goodnow Wildman (1912 – 2004), emeritus professor of biology at the University of California, Los Angeles.

[37] Melvin Calvin, *Following the Trail of Light: A Scientific Odyssey* (Washington, D.C.: American Chemical Society, 1992).

who was publishing disparaging accounts, remarks in his papers about my colleague's work and sort of poisoning the whole situation. And then he got elected to the Academy[38] and I haven't gone to the Academy since. I don't want to meet the guy.

Harkewicz: Okay. So, it isn't always good science that gets . . .

Benson: Well, it's personal. There's a lot of scientists who never get into that kind of personal point of view.

Harkewicz: But that doesn't seem like an institutional type thing. It seems like it's across the board?

Benson: It's just the personal, I think.

Harkewicz: Earlier you talked about going on scientific cruises. I guess that would be something you couldn't have done at some of the other institutions you were involved in? Isn't that true?

Benson: It could have been, if Bob Peterson was there. You didn't know Bob Peterson but he had an IQ of 185, which is not too shabby, and he realized it too. So, he would argue with Nierenberg, or John Isaacs, or anybody.[39] And, Bob was usually right. He was trying to get both of them to quit smoking and they both died of lung cancer.

Harkewicz: I guess he was right, huh?

Benson: I got along fine with Bob, or he appreciated my nonsense. And, I would design a little lab and he would build a ship around it, four ships in a row doing that. In spring we'd go down and chase corals in the islands 500 miles southeast, southwest of Baja, Cabo San Lucas. And then in summer we'd go up in British Columbia and chase spawning salmon looking for the reasons that they were falling apart a week after they spawned.[40]

Harkewicz: So, that's something that you wouldn't have done if you were at Penn State, I would assume.

Benson: No, it wouldn't be, wouldn't have been possible. But, it was possible here because we had a connection with Scholander. And, Bob Peterson had a high regard for Scholander but he didn't want him on his boat. [*Laugh*] Scholander was too independent.

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[38] National Academy of Sciences.
[39] William Aaron Nierenberg (1919 - 2000), SIO director 1965 – 1986; John Dove Isaacs (1913 – 1980), Scripps biological oceanographer.
[40] See footnote #27.

Harkewicz: How was it being on a boat doing research? How did you like that? From a personal perspective, what was it like being . . .

Benson: Oh yeah. It's exciting. Yeah, we got a lot done, especially on the *Alpha Helix*[41] because I had a group of fifteen medical scientists and they all worked on their own stuff with equipment in the lab that they could deal with, including an electron microscope. The first one on any ship. And, it worked like a charm. We found out where the salmon store their fuels, their fat globules. That was terrific. And, we had one of the early inventors of electron microscopy aboard, Fritiof Sjöstrand[42].

Harkewicz: Onboard the ship?

Benson: Yes. Fritiof Sjöstrand, the Swedish inventor of many aspects of electron microscopy. And then there was a student from U.C. Davis that earned his degree there and he produced the best, most useful results. That was on the *Alpha Helix*. But, the labs in Bob Peterson's boats were much smaller.

Harkewicz: Were you ever chief scientist on any of these cruises?

Benson: Yes, but not on all of them. Well, on all of Bob Peterson's boats I was.

Harkewicz: You were?

Benson: Well I was on the *Alpha Helix* too when I had gathered all these medical guys. They were top notch, top notch people.

Harkewicz: I know you still go up to Alert Bay. Is that more of a land-based type thing?

Benson: Yes, it is now. For a long time we moved the ship up there and we worked onboard the boat. And then friends in Alert Bay cornered a hunk of B.C. Lottery money to build a laboratory.[43]

Harkewicz: Is that affiliated with Scripps?

Benson: No. It's affiliated with the UBC[44] through their professor of fish biology, really. And, he's now living in Hong Kong. He has a Chinese wife, and his salary is better in Hong Kong.

Harkewicz: I guess you might as well go where you can get the most money?

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[41] The RV *Alpha Helix* was a unique ocean-going research vessel with laboratories specifically constructed for biological work and designed to go to locations as varied as the Bering Sea, the Amazon, and the Great Barrier Reef of Australia. The ship's design originated with Scripps scientist P. F. Scholander (see footnote # 12), was built with financial support from the National Science Foundation, and managed by Scripps.

[42] Fritiof Sjöstrand (1912 -), emeritus professor of zoology, University of California, Los Angeles.

[43] Benson later added, "courtesy of the B.C. lottery."

[44] University of British Columbia.

Benson: Yes. He's an excellent scientist, and Don Wilkie[45] was an important aspect to that because he's Canadian, and we get along fine with Canadians.

Harkewicz: So, you've done a lot of work with plants, with sea plants and land plants, and fish. How would you identify yourself? Would you call yourself a marine biologist or would you call yourself a biologist or an oceanographer

Benson: Well, I don't know. Just a good plumber. [*Laugh*]

Harkewicz: A good plumber. Tell me what that means.

Benson: Oh, I can put things together, and I seem to be lucky in putting people together too.

Harkewicz: People that work well together?

Benson: Yeah. Well, they interact scientifically together.

Harkewicz: A good plumber. Okay. That's not very glamorous sounding though?

Benson: No. It doesn't sound glamorous but it . . .

Harkewicz: Well, I wanted to ask you a little bit about your role as associate director at Scripps. For a while, you were responsible for coordination of biological research and teaching activities and you also were curriculum coordinator for the marine biology department. What was that like?

Benson: Well, that's nothing, nothing very novel about that.[46]

Harkewicz: But, I wonder how you felt about teaching activities at Scripps? Do you feel there's a right balance here between teaching and research?

Benson: My strongest feeling now is that people think they can come to Scripps and stay for five years and get paid for it, and I'd rather accept students who want to come for the first year and not get paid, bring some money themselves, or have their parents pay. And, if they turn out to be good we keep them. If they're not good enough, we don't keep them. I got a PhD in three years, and some people can get it in one year. But, I think three years is enough.

Harkewicz: Is that a recent phenomenon, do you think?

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[45] Donald W. Wilkie (1931 -), marine biologist and director emeritus of the Birch Aquarium at the University of California, San Diego.

[46] Benson later added, “I don’t recall making any waves.”

Benson: With Scripps they're all five years, and I think it's a waste of good government money. And, it's to the advantage of the professor for whom these good students are working for a long time and producing good papers. I mostly know Farooq Azam's[47] students, who have been excellent, and they're outstanding guys, and it is the greatest help to Farooq having these students long enough to produce a string of papers that are highly regarded. But then they all get good positions afterwards too.

Harkewicz: But, you're not saying there's bad students that are staying around too long, necessarily, it's more like the professors are taking advantage of the money the students bring in or something like that?

Benson: I think so. I think the students should be better prepared or we should let them know more effectively what they should know. At Caltech when you arrive you take a series of exams in different aspects of chemistry, and you can pass them right off, and then you proceed doing research the first month. Whereas you come here, new students and new students sit there and read a book for their first year and that's stuff that they should have known all along, or else it's not worth knowing. I don't know.

Harkewicz: Why do you think that happens then?

Benson: Well, I don't know. Some professors wants the new students to know everything in their own field. It's complicated.

Harkewicz: Okay. So . . .

Benson: So they can answer very technical questions.

Harkewicz: Is it the nature of oceanography, you think, versus the nature of physics, or chemistry as it is taught at places like Caltech?

Benson: Yes. Well, it's such a widespread collection of interests in marine biology, from structured evolution and genetics, and whatever. It's hard to ensure that, or hard to be confident that, every student should know all that stuff.

Harkewicz: So, you tell them to read a book to make sure they know the stuff?

Benson: Yeah. I always ask them how the battery in their car works and they don't know.

Harkewicz: Well, with a chemistry background I guess that's important.

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[47] Farooq Azam (1961 -), research biologist in marine microbial ecology at the Institute of Marine Resources and professor of marine biology at Scripps.

Benson: And, as a matter of fact right now the students in marine biology they don't know what the main source of nutrition for the animals of the world is. It's not fat, carbohydrate, or protein. It's wax.

Harkewicz: But they come here as marine biologists and they don't know that?

Benson: No, they don't. But, they're good geneticists and they know how to clone an enzyme.

Harkewicz: Well, now that almost seems like something that's more discipline-oriented in a sense?

Benson: It is.

Harkewicz: I mean, is genetics like *the* thing so people don't know the more . . .

Benson: They don't know the fundamentals. There was an article just published that metabolism is back into popularity again because they realized there's a lot of things they don't know about metabolic processes.

Harkewicz: Well, I don't know if you can answer this but do you think this problem is a Scripps problem -- this situation you talk about at Caltech, is that happening nowadays, can people still go in and out of there quickly?

Benson: I think so. I mean I, I'm in communication with a lot of the young alumni and the students who are trying to raise some money. We never had to raise any money but these people have, I guess, more social responsibilities than I did.

Harkewicz: You said you never had to raise money. What kind of funding support did you get then?

Benson: I had a Coca Cola Fellowship.

Harkewicz: When you were in . . .

Benson: At Caltech, as a graduate student.

Harkewicz: What about here at Scripps as a professor?.

Benson: Oh, I had all kinds of – mostly National Science Foundation, and some NIH.[48] And, then we had a government ecology grant that wasn't very interesting, but analyzed all kinds of creatures offshore. So we would have a baseline of contaminants and so forth of marine creatures of all sorts. We were involved with about 10,000 samples or something. I didn't do much of it but we had some good people working on it.

[48] National Institutes of Health.

Harkewicz: Well, many of the other interviewees that I've spoken to complained about having to spend a lot of time writing grant proposals and not being able to do enough work.

Benson: It's much worse now than it was, and it's a darn shame. It's a waste of effort, but I don't know any alternative. You just have to be a good salesman, and some of them maybe aren't.

Harkewicz: So, they find it more difficult because they're not good salespeople?

Benson: Yeah. Well, I've had several colleagues who are definitely poor salesmen. Brilliant scientists but not able to sell their abilities for funding. I think it happens a lot everywhere.

Harkewicz: Earlier you said that you had inherited your father's sneakiness or cleverness. You mentioned that when we first started talking. Do you think that helps your salesmanship?

Benson: Oh, I don't think my father was sneaky.

Harkewicz: But you said he was clever.

Benson: He was very clever.

Harkewicz: So, do you think your being clever can help you with your salesmanship?

Benson: Oh yes. It should. Well, it should. But, it's helpful in doing an experiment and you don't want to waste your time asking the wrong question in the experiment. Melvin Calvin, for instance, would propose about six different experiments everyday. None of them would work. They'd all cost too much, take too much time, and there were better ones to do.

Harkewicz: Well, it seems like a lot of the work that you do is, has maybe applications to health or agriculture?

Benson: Right now, yes.

Harkewicz: Do you think that helps you get funding too? I mean, does that make your stuff more saleable, do you think? It's more applied than basic? Or maybe that's not fair?

Benson: It's pretty applied. Yes. But, I was raised under an apricot tree so I know the agriculture. I can handle a shovel real good. [*Laugh*]

Harkewicz: So, it sounds like you're very hands-on then in that case?

Benson: Yeah. For agronomy it's too tedious but it's amazing what has been done in the last 30,000 years in the Americas, as a matter of fact, in developing crop plants. Corn is the most brilliantly developed one but there's a lot of other, canola, and -- oh what's the other one? Oh, a big plant that has little teeny seeds and the stems are fibery that you can make clothes out of it?

Harkewicz: Hemp?

Benson: Well, no, not hemp. My computer takes a while to go through the whole tape until I come out with the answer that works.[49]

Harkewicz: Well if you think of it down the line you can tell me. I feel like you might be running out of steam here so I just have a couple more questions I want to ask you but then we can keep talking if you like. One of the questions that I ask everybody that I interview is how you feel that Scripps affected your life? How do you think you would answer that question?

Benson: Oh, the great advantage of Scripps is that you can work in any direction that you want to work. Nobody grumbles about it. I'm not a good teacher, really, but I think I inspire a little enthusiasm in people because I'm enthusiastic about what they're doing, and their good ideas are fantastic.

Harkewicz: But you think your enthusiasm doesn't relate to teaching? I mean, I've always thought that, in being a teacher, one of the best things is to be enthusiastic about your materials?

Benson: Yeah. Yeah, but by comparison the teachers at Harvard are head and shoulders better than anybody else's teachers. At Caltech some of them are good and some of them are not too good. But, I'm sure we've had some really great teachers here at Scripps.

Harkewicz: So, you say that at Scripps you're able to do whatever you want to do?

Benson: Yes. In any direction, in more directions than in most schools, because it could go all the way to the ends of the earth, or the bottom of the sea, or the atmosphere.

Harkewicz: So, I have two other questions, like two sides of the same coin, so to speak. One side of this coin is, what do you think has made Scripps successful? And, the other side is, what do you think has threatened its success? So, first of all, what do you think has made Scripps successful?

Benson: Oh, because people are supported in the exploration of space, and water, and atmosphere.

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[49] Benson's reference to "my computer" was in reference to his memory. He later recalled that the plant he was trying to remember the name of was Amaranth.

Harkewicz: Supported by the administration?

Benson: Yeah. Yeah.

Harkewicz: Okay.

Benson: Yes. And, as far as support of my own research, Bob Peterson had a lot to do with it, because he was spending $150,000 a year to keep the ships going for me. That's a lot of work, considerable support. And then, after he died I'm living on a grant of $50,000 from Maureen, his wife.[50]

Harkewicz: Is that sufficient for what you need to do then?

Benson: Yes, so far.

Harkewicz: Okay.

Benson: Well, I've blown most of it, [*Laugh*] and I don't know how much further I can . . .

Harkewicz: So, it sounds like he's been very – from what you've said throughout this interview he was very instrumental to your life?

Benson: Yes. To support me in doing what I like to do because he appreciated my enthusiasm, and I appreciated his, of course.

Harkewicz: So, the alternate side then is what do you think has threatened Scripps' success?

Benson: Oh, it's too bad that I didn't get to know Martin Johnson[51] better. He was a priceless guy and a wonderful gentleman, absolutely. But, he didn't push himself around. So, I spent as much time with him as I could, but he was a pioneer in marine biology really. He was the expert of zooplankton.

Harkewicz: So, you think the loss of people like him has been a loss to the institution?

Benson: Oh, I don't think they've replaced him with that kind of a spirit. And, well I followed John McGowan's[52] observations for a long time and they're pretty interesting. And, I got interested in McGowan's way of solving a problem and in doing an experiment with schooling fish. And my friend – oh why can't I think – he was one of the leaders in the fisheries, oceanography. He's from Scripps. But, he was looking at schooling fish and John Isaacs had the idea that if a school of fish would dump their waste, on cue, by a leader, it would make, you know,

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[50] Maureen Frances O'Connor (1946 -), wife of Robert Oscar Peterson and mayor of San Diego from 1985 – 1992. See footnote # 27 for more information about Peterson and his financial endeavors.
[51] Martin Wiggo Johnson (1893 – 1984), marine biologist at Scripps.
[52] John Arthur McGowan (1924 -), professor of biological oceanography at Scripps

patches of nutrition in the ocean and that would explain John McGowan's observations of the patchiness of populations in the North Pacific. And, I didn't notice that John McGowan thought that was very exciting. But, maybe he did. I don't know. But, John McGowan's observations were exciting to me. Reuben Lasker[53] is the man.

Harkewicz: Okay. Reuben Lasker.

Benson: Brilliant guy. And, Reuben Lasker was telling me about how a copepod swims. And, Rudi Strickler[54] too. Rudi Strickler's brilliant. But, a copepod goes like that. Then he goes around two turns and he goes like that. And, that's the way you smell. Did you notice that?

Harkewicz: No. I guess I hadn't.

Benson: If you march into the house from outside you can smell the onions if they've been cooking. But, if you stand there for a while you don't smell them. You only smell them when you're . . .

Harkewicz: When you're moving?

Benson: Smell a change.

Harkewicz: I see.

Benson: And this is true with all kinds of creatures in vision, and odors.

Harkewicz: So, do you think that people – I mean, you mentioned these people as what you thought threatened Scripps' success. Do you think that there's not people that think the same way as these kind of people today. I guess I'm just wondering what you're getting at.

Benson: Well, it's sad that, the loss of Pete Scholander was sad, of a genetic lung disorder. But, I, I don't know. I was on the committee that selected Bill Nierenberg as director, and I thought he was just a terrible guy with a lot of energy, but it turns out he's been one of our greatest, in my period here. He was certainly an outstanding director.

Harkewicz: What made him an outstanding director in your mind?

Benson: Oh, he got things done. He saw the big problems and he went and got the money and convinced everybody to do it. And, we were having trouble with getting them funding from NSF for our marine biology building. And, Nierenberg went

[53] Reuben Lasker (1930 – 1988), adjunct professor of marine biology at Scripps.
[54] J. Rudi Strickler (1938 -), Shaw distinguished professor of Biological Sciences, University of Wisconsin – Milwaukee.

to work on the state and got the money. So, he could get things done. That's for sure.

Harkewicz: Do you have any thoughts about our new director?[55]

Benson: No. Except I have a girl friend in Australia who knows him well.

Harkewicz: That's good.

Benson: Yeah.

Harkewicz: Okay.

Benson: Well, she's a great lady, a good friend of Francis Haxo. She's been here many times. And also, a superb violinist.

Harkewicz: Would you care to name her or is that something you'd rather . . .

Benson: Oh no. Shirley Jeffrey[56]. I got her elected as a foreign member of the National Academy of Sciences. And, before that I was on the committee but I didn't have anything to say about it, she got a special medal for algology that the Academy gives, just that was the year before she was elected.

Harkewicz: So, do you think that Scripps affected your personal life? Do you feel like you had any, any interactions with people here that . .

Benson: Oh, a lot of them, but I couldn't specify any one. My closest friends are from Penn State and they live there. But, we talk the same language in nutrition.

Harkewicz: Of nutrition, did you say?

Benson: Yeah. He's the world expert on milk.

Harkewicz: I see. So, do you sit around and talk about work all the time?

Benson: Well, it usually works out a lot more comfortably. We had a big roundtable dinner party of the botanical group at the Academy. And, my wife says, "None of this boy-girl stuff." All the girls sat on one side [*Laugh*] doing girl talk and all the fellows on the other side, and then a group of the, you know, the secretaries and staff from the Academy were on an adjacent table. And, they got up, when we left, "You people are having too darn much fun. It's not fair." [*Laugh*]

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[55] Anthony Douglas-John Haymet (1956 -), named director of Scripps Institution of Oceanography in September, 2006.

[56] Shirley Jeffrey (1930 -), one of the world's foremost authorities on microalgae and phytoplankton. In 2000, she became a Foreign Associate of the American National Academy of Sciences.

Harkewicz: I see.

Benson: But, that means that you talk about stuff that interests you, with most enthusiasm.

Harkewicz: Yeah. Well, that's true. I guess I'll just ask one other question and then we can end this, unless you want to keep talking. You know, there's been a lot of social changes over the years of your working as a scientist, you know, the Women's Movement, the Civil Rights Movement, the Environmental Movement, all sorts of things like that, and I'm sure, you know, we talked a little bit about some of these things, you know, like antinukes and . . .

Benson: Good questions.

Harkewicz: Do you feel these Movements have affected you at all, or your work, or science as you see it?

Benson: Well, the environmental people are screaming about a lot of things that they don't know much about, and I think that could be proved. But, I'm not going to spend my time. There was an article in the paper this morning that got me all fired up, so I sent an email to the guy who put it together. I think it was political and somebody reporting something in the front page of our newspaper.

Harkewicz: The *Union Tribune*?

Benson: It shouldn't be political. It was about recycling drinking water.[57] And, it was just as bad a collection of propaganda with no real basis. He doesn't understand what bacteria do with medicines and drugs that people dump into the wastewater. He figured they would be recycled and damage people a second time, which is not true. And, I happen to know something about the enzymes that degrade molecules like that, and the FDA does too. So, you don't get approval of any medication unless it's biodegradable. And, it has to be demonstrated and proved by whoever's pushing it. And, these people who like to write propaganda sure do it and there's a lot of unbased statements made.

Harkewicz: So, that's more like a personal level, though. It sort of fired you up, like you said, when you were reading the paper?

Benson: Oh I . . . .

Harkewicz: Do you feel like you run into that at work too?

Benson: I'd like to drown those characters. [*Laugh*] Because, they're all pushing for desalinization of seawater because it sounds so neat. But, the good Lord did it with solar energy. Everybody's talking about harnessing solar energy with little things on their roofs and stuff like that, and the solar energy is what we harness by

[57] "Recycled tap water's 'unsettled question.'" *The San Diego Union-Tribune* (September 26, 2006).

collecting the water and using fresh water. And, we should conserve it; not dump it back into the ocean. It took us skillions of kilowatt hours of solar energy to boil all that water out of the ocean and put it on the mountains and rain it on the valleys where we could, at least we save as much as we can and use it, but then to dump it without cleaning it up in a situation where we know how to clean it up. And, one of my graduate students, her name was Alice Tang,[58] a little gal about five feet tall but she has the brain of a wizard, and she retired as a professor of microbiology at San Diego State, and she's been on the California State Water Board. She knows the politics of the whole system and she said the politics are too difficult to fight. They're too entrenched.

Harkewicz: So, when you're trying to get funding from NSF do you run up against these kind of things then? I mean, do you have these political problems?

Benson: No, I don't think so – I don't know.

Harkewicz: You don't?

Benson: I don't think so. But, this water problem is political, I'm sure. And, sure that the companies supporting desalinization plants - they'll do anything to misguide the public into thinking that recycled water is bad for you. That's what the thing, two-page thing in the front page of the newspaper, and it makes me boil.

Harkewicz: Have you ever wanted to write anything for the public or speak in front of the public to try to clear up any of these things?

Benson: Well, yeah, I got, I wrote an article and I sent it to Alice but I haven't heard from her. But, I think I'll get back to her.

Harkewicz: Alice?

Benson: Alice Tang. Her name is Tang. It was . . .

Harkewicz: Oh, I'm sorry. The woman you were talking about. Yes.

Benson: It was Jokela when she was here. And, her son, whose -- his name is Jokela, I guess -- but now he has a huge office and hundreds of secretaries and things for something like AOL in New York. He's just a powerful, brilliant kid.

Harkewicz: I see. Well . . .

Benson: Lately, I'm most, more interested in cancer though.

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[58] Alice T. Jokela (1942 -), marine microbiologist and professor of microbiology at San Diego State University beginning in 1969.

Harkewicz: Well, that's good. I don't think you're going to run into too many people that are against cancer cures.

Benson: No. But, it's because of the fact that I -- Otto Warburg,[59] W-A-R-B-U-R-G, was a good friend of mine, and very helpful, and I spent some time in his lab on several occasions. And, he was the most brilliant man in the development of biochemistry ever. Single-handedly, he recognized and isolated the enzymes and coenzymes for oxidation and reduction in metabolism, which is about as much as you can do. He was just a genius and he was well supported in Germany, and even though he was one-fourth Jewish, Hitler took very good care of him because he knew he was so valuable. And, Warburg had a theory about the difference between normal tissues and tumor tissues, and they have a different kind of respiration. And, Warburg had invented the apparatus to measure respiration rates. He was a genius in that sense too. And so, it turned out that this business with ascorbic acid, vitamin C, appears to be fitting in nicely with Warburg's observations and the observation that intravenous ascorbic acid, or its derivative that I had recommended a long time ago, it sort of puts, things fit together and that's what you call a "discovery."

Harkewicz: That must be exciting - to have pieces of the puzzle falling in place?

Benson: You can't prove it to anybody yet, but Francis Knowles and his wife are the best people in the world to explain it. So, I just feel so fortunate to have known the best people in many fields, so you can discuss specific questions with them.

Harkewicz: Well, it does sound like you've known a lot of people in a lot of different places?

Benson: Well sure. Well, everybody knows a lot of people.

Harkewicz: But, I mean important people.

Benson: Well, productive.

Harkewicz: Well, I hope I haven't taken up too much of your time? Is there anything else you wanted to add to put down for posterity or anything that I didn't cover?

Benson: Oh, I got a lot of things for posterity. Some things I've written, but I don't remember what they are.

Harkewicz: Okay.

Benson: The trouble is I can't keep up with, with things as they go. I get so excited reading *Science*, or a magazine called *Inform*. It's about fat metabolism and

[59] Otto Heinrich Warburg (1883 – 1970), German physiologist who won the Nobel Prize in physiology in 1931 for his work on cell respiration.

industry. It's just amazing what these people can do. So, I'm all excited about a lot of aspects of fat metabolism.

Harkewicz: So even with in all the years you've been in science you still are excited about different things?

Benson: Oh, it's worse?

Harkewicz: It's worse?

Benson: Oh, because so many things are happening and we have better ways of communicating. Because I read something and I scan it and I send it to my people in Russia, or Germany, and South America. It's just terrific what you can do if you take advantage of the situation. In November, three of my friends are coming from Vladivostok and I think I'll introduce them to Tony when they're here.[60]

Harkewicz: The new director, correct?

Benson: Yes.

Harkewicz: Great.

Benson: Anyway, one of them is a friend of fifty years, a top natural product chemist of Russia. Like Bill Fenical,[61] that kind of a chemist. And, he's a wonderful guy. He's been here before. But, his wife is a big wheel biochemist, but on the political side. And, she was my shipmate with me on a Russian research ship in the Seychelles. We haven't gone into any of these places I've been running around on strange boats with.[62]

Harkewicz: Well, if you want to – I mean I just felt like I took up too much of your time. But, I mean you could keep talking if you'd like.

Benson: That's exciting that she's coming too, because I know her pretty well and she's a powerful lady, and the new director of the Institute of Marine Biology in Vladivostok. It's a big institute. It's a classic place. The previous directors were good friends and the last director was killed in an auto crash. It's sad. His son is an architect. As a student he came here, so we saw him a lot for a month or two. They designed and built a little monument, or rather a complex monument to the

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[60] Benson later noted two of the three Russian chemists: Andrey Adrianov, director of the Institute of Marine Biology, Far East Branch, RAS, Vladivostok, Primorge; and Victor E. Vasknovsky, professor at the Institute of Natural Products Chemistry University.

[61] William Fenical (1941 -), distinguished professor of oceanography at Scripps.

[62] Benson later noted that "these places" include: the Great Barrier Reef, Norway, Trinidad, Australia, New Zealand, and Japan.

Pacific Basin countries on the end of Treasure Island.[63] Anyway, it's park area. It's a nice thing and it was designed by a popular San Diego architect whose house burned in the big fire five years ago, James Hubbell.

Harkewicz: Well, thank you very much for talking to me.

Benson: Well, it's been a pleasure.

[63] Treasure Island is an artificial island located in San Francisco Bay that features a job training center and low-income housing. Benson was most likely referring to Liberty Station, which is a tourist destination located on the site of the former Naval Training Center in San Diego. Liberty Station is designed to celebrate San Diego's maritime history and open a public access between San Diego and Mission Bays.