Marvalee Wake Legacy Project Interview

Jim Patton
I'm Jim Patton. I'm an emeritus professor in the Department of Integrative Biology and curator of Mammals in the Museum of Vertebrate Zoology. And since 1969, when both my colleague to my left here, Marvalee Wake, and I came to this campus, she has been a close friend and a colleague both early on in the Department of Zoology, and then as that transformed into the Department of Integrative Biology. In many respects, it's a real delight to talk with you, Marvalee, today, because this interview bookends the interview that I had with her husband, David Wake several years ago. And as we will show today Marvalee along with David are probably two of the most important biologists on this campus with regard to the impact that they had on the development of modern biology on their campus.

So that's one of the main themes that I want to address with Marvalee. Marvalee is currently, I guess, your title is still Professor of the Graduate School, and she maintains a program which she continues both in the service area and in her research area. And we'll talk about some of those aspects as well. So Marvalee it is a real pleasure and a distinct honor to be here beside you today. Thank you.

Marvalee Wake
Thank you, Jim. I'm delighted to be with you today. It will be fun to talk to you about all this.

Jim Patton
So Marvalee. This morning, we're going to kind of forego, at least initially, the standard, you know, where were you born and how did you come into biology and those kinds of things. And rather center on how you came to campus. You arrived with your husband, David, in 1969. David was recruited by the Museum of Vertebrate Zoology and the Department of Zoology. But you were not a spousal hire or spousal wife. I mean, you were a spouse, but you were not treated as a, David's recruitment was not treated as an issue of spousal hire for you. So but yet you obtained a full line appointment and proceeded through academia on campus to a full professor of standing and achieved the campus award of the Berkeley Citation at the time of your retirement.

So how did that happen? And what not just how did it happen, but what lessons might have been generated from your early career steps with regard to how the campus ultimately has been dealing with spousal issues?

Marvalee Wake
Yes. Dave and I had no thought whatsoever that there might be a chance for a position for me at Berkeley when we together made the decision for him to come to Berkeley from the University of Chicago, because it was clearly well, a better situation for him and a logical move for him to make. I had just made assistant professor at the University of Illinois in Chicago, which was a very new university at that time, and it was having great difficulty getting its legs.

I was quite happy to leave and take my chances finding something in the Bay Area one would hope. I'd finished my Ph.D. only a year and a half before and then was appointed from instructor to assistant professor, so hadn't had that much time, would hardly be eligible for any line, position or anything like that at Berkeley. So I had spent part of the year writing other institutions. Nothing had really come up. Friends at Berkeley were on the watch for me, and but nothing was materializing. We arrived in summer of 1969. One day I was in helping Dave set up his little lab with microscopes and all that when that afternoon, Paul Licht, who I think then was chairing the department, called Dave and said was Marvalee around, we really want to talk with her.

So who's "we" in the first place? Well, I was, so I went to see Paul. Paul was sitting in a meeting of the faculty who were setting up to do the new Biology 1 course for the 1969-1970 academic year. About three or four years preceding that, Berkeley was on quarter system and under the leadership of Rod Park, who was Dean of the College of Letters and Science then. They decided in about 1967 that there was terrible redundancy among the introductory courses in biology, among the seven departments of some kind of biology in the College. So Rod Park led the effort to develop a combined general biology course as the introductory majors course for all of the departments and also for a non-major course, similarly. They created a department, a paper Department of Instruction in Biology to be the bearer of these courses, and its chair was to coordinate the acquisition of faculty from the diversity of departments to teach the course.

The program was such that some really sterling professors were involved–Park, Licht, Watson "Mac" Laetsch, a number of senior professors, all known to be very, very good teachers. And they took a complete and serious interest in the development of the course. So they introduced that to me, and the pragmatic point was that they thought they had hired a person as lecturer to coordinate the development and operation of the laboratories for that course. Somehow somebody had overlooked his letter of resignation and he had taken a position in Canada. So about a month before the course was to start, they didn't have that position filled. Well, at Illinois, I had been quite thoroughly exposed to what were then new modes of teaching, mastery learning, individualized instruction, such things as that that they wanted to include in that course. So it seemed I could bring something to it. So after thinking about it, I well, I'll give it a try.

Jim Patton
So how did you get from that initial step into the Department of Instruction in Biology to a…

Marvalee Wake
From that meeting.

Jim Patton
Yeah. I mean, an advanced professor. I mean, professorship. Well.

Marvalee Wake
The chair of the Department of Instruction in Biology was also at that meeting. So he at the end of the meeting said, "I want a decision from you within a week." And he had the lecturer FTE in hand. So it was a sudden and direct and non-recruitment kind of appointment.

Jim Patton
So you got thrown into the Wolf Den; what, a couple of weeks before the semester and a quarter actually started?

Marvalee Wake
I had thought I'd be preparing my dissertation chapters for publication rather than on helping to modify what was already done, but to initiate some of the newer things they wanted to see done for the course. And all I can say is that it seemed to work. I had a small office. Among the principles that were involved were that the faculty members of the course went always to each other's lectures. They always went to the lab meetings at which the GSIs got their preparation largely from the Lecturer, but also with input from the lecturing faculty and some good principles like that became abandoned rather too quickly, I think. But at any rate, a good, cohesive course developed, including some of the things that we do to this day, the exercise of the Botanical Garden, things like that.

So I did that sort of thing for about two and a half years, and they asked me after a year or so to give a lecture or two in the course and things like that. So I was pretty fully involved in both the

development and the activity of the course. At the same time, Rod Park had asked me if I'd be interested in being an assistant dean of the College of Letters and Science. There were half a dozen such professors who advised students about difficulties, having to see them about petitions and so forth. And I thought, well, that's a way to learn how the student side of the College and the university works. So I said yes, and that was working well. But anyway, at this two-and-a-half-year point, all of a sudden there appeared at my office door the chair of the Department of Instruction in Biology, the Chair of Zoology, and the Chair of Botany. And they said we need to talk with you. And I said, "Oh, oh", I thought, Well, this must be it. Well, it was it, but a very different "it". They said, we have a line FTE and we have proposed that you, if you are interested, be appointed. The Department of Zoology is willing to provide you access to graduate students and lab and facilities and lab management. And it would be a joint appointment: Zoology and the Department of Instruction in Biology, in the paper department. And I assure you that I was floored. But I said, Well, what's involved? And they said, Well, of course, Zoology wants to review your credentials. And I said, "Well, I would hope so." So I gave a seminar, and as I understand it, a rather complete review ensued and they offered me a position, as I've just described, which I was absolutely delighted to accept.

Jim Patton
So that was in what year?

Marvalee Wake
That was 1973.

Jim Patton
73. Okay. And so you became a member of the Zoology Department. What courses did you teach initially? And I want to talk later on about the specialty course that you offered. But what was your role in the department?

Marvalee Wake
Well, I continued my role in the Biology 1 course. I stayed on, in effect, as that lecturer, but more involved in the actual lecturing, but still a lot of writing the training of the GSIs and so forth, offered a graduate seminar each quarter then and things like that. One of the things that made it a little sketchy was that my mid-career review had to be my first year as assistant professor, and of course nothing was really established yet. But then by the time of the tenure review I did have graduate students and my research program was coming along. And by then Rod Park had asked me to be associate dean of the College, and at that time Associate Dean was a member of the Council of Deans and was, in effect, the faculty member normally nominally in charge of the Student Services Division of the College of Letters and Science.

So I learned a lot more about how the university functions; did that for about three or four years.

Jim Patton
Did that offer you teaching relief or.

Marvalee Wake
It offered me the opportunity to continue my full load in Biology 1 and do the graduate seminars. But I was seeing that this isn't a progressive way to look at this. Is there a way beyond this? And they said, "Well, of course we've been waiting for you to ask."

Jim Patton
But I mean, a standard teaching load at least that was presented to me when I arrived was participation in one of the core undergraduate courses; teaching a graduate seminar. Because the

graduate program was primarily seminar driven rather than regular course driven, but then teaching a course in your specialty. But it took you time before you were able to get into teaching the course in your specialty. Now, as I say, we'll talk about that later on. Okay, good. Primarily interested right now in, I like the emphasis that it was the it was the faculty that saw something in you that allowed them to figure out how to create or find a line FTE for you to move forward and how that if you have any insights into how that has impacted the way we recruit spousal hires today. If you have any insights into that.

Marvalee Wake
I have thought a lot about that, both the way mine occurred and the way others at that time were considered and the way policies and interactions have changed since.

Jim Patton
Yeah, I mean, what were the hindrances in creating spousal hires?

Marvalee Wake
That's what I was going to go next to. Part of what they said when they said they had the FTE, as I learned, as discussion went on, was that yes, the college had a few FTE sort of held in reserve in the dean's pocket and he could pretty much do this. So somehow these three chairs had gotten together and commented on competency, I guess, and, and asked if one of those FTE might be available. Well, the point of interest beyond that was this hip pocket set of FTE over approximately a four year span resulted in the regularization from either the research ranks or the lecturer series of Marian Koshland for the Department of Immunology, Giovanna Ferro-Luzzi Ames in Biochemistry, Marian Diamond in Physiology and Anatomy and me all faculty wives.

Jim Patton
And a pretty impressive group.

Marvalee Wake
And the others.

Jim Patton
of scholars.

Marvalee Wake
So it was pretty clearly an effort to recognize the professional responsibilities that a number of people on campus who happened to be wives with full sets of all sorts of responsibilities were capable of doing and the college, and the university did it. This has become an issue over what we are talking about the 50 years that I've been involved in these sorts of situations, because there was a lull in it. In fact, a chair of Zoology is well known for having advised his graduate students not to interact with their fellow graduate students because that could only result in trouble and they might not get jobs. You can guess the set at which he directed those comments, but beyond that, there became more concern because there were more professional partners. There had always been in each of these departments wives who were their husband’s assistants.

I think of Molly Balamuth, Bill Balamuth's wife, in Zoology. They published jointly on papers on the structure and function of protozoans and so forth. And she was a distinguished and influential researcher as well as Bill, but she didn't teach. She was the assistant. That was more the tradition that had gone on. But the greater number of partners meant more interest in finding situations. And people tried to do that. Some departments were more open to it than others. Some colleges were certainly more open to it than others. Some departments within colleges have that; the physical sciences, for example, were considerably slower than the biological and the social and of course,

the humanities for looking carefully at the potential fit of spouses to potential openings that might exist at the time or in the near future.

But there was considerable resistance because of space issues, funding and that sort of thing to even adjunct appointments. There was the mistaken impression that some of the people, the primary person, male or female, who was being recruited was coming, in effect, to just set up shop with and bring the family, and that would be it. And then do what was hired to do for a relatively limited time and then do whatever he or she wanted to do. Well, at about that time, I had gotten involved in some other things. I wrote a paper that was published in BioScience on two career couples, and it was accompanied by a paper that Jane Lubchenco wrote about shared appointments. And there was another paper about getting a job in a museum-style institution separate from the institution in which the recruited person had been.

But what would the relationship be? So we were all looking at different ways that partners could be facilitated in maintaining the professions that they had set out to do.

Jim Patton
And that also benefited the university at the same time.

Marvalee Wake
That's right. And we tried to say that there are many ways to do this. Not everybody say a person has 4 children, they might have a different way that they want to deal with the family issues. So part time jobs of various sorts. So we tried to get different departments to set up, sort of an information bank so that all incoming recruits at the time of negotiation might have an idea about where they could get information, what the possible sources were, what of what timing was like for various things. In other words, how the system inside and out worked and those kinds of efforts stay available for the half-life of the individual who put them together. They have rarely, I think, even to this day, become institutionalized, although I think it's much better now because the notion of a spousal hire is always introduced during the negotiation phase with a recruit, with the explicit understanding expressed as we've seen in Integrative Biology for many years now, that there might not be a fit, that adjunct status might be a possibility, but there is no space for developing a research program and at least our department, and I think a few others have very recently changed their attitudes about the adjunct position. Yes, it is not a Senate line FTE, but if a person is to be given the title of Adjunct, that should carry the responsibilities of the professorial line that is the roadmap for an adjunct and that means space and students and teaching responsibilities. Furthermore, adjuncts, at least the way IB has done it, have had the possibility of deciding whether they wanted to have a teaching emphasis or a teaching and research emphasis, never a research alone emphasis, with which I happen to agree.

So as the sociology of the situation has modified, I think that Berkeley, or at least parts of it, have made conscientious decisions about how to maintain professional quality, professional responsibility and gain the value that new people unexpectedly available can provide. It won't always work, have to be completely upfront about it. The FTE is not there at the recruitment time. It's up to the department to do an evaluation of the person and the people involved to see what the prospects would be for them. It's much more open, above board.

Jim Patton
Much more open, much more possible. It's quite different than it was when you came, all for the good.

Marvalee Wake

Yes, I'm a creature of serendipity.

Jim Patton
So I'd like to move on to another topic that's central to your life here. You then became an assistant professor in zoology in 1973. By 1980, I believe it was, you were promoted to full professor, and it wasn't too long after that, if I'm not mistaken, you became the chair of the Department of Zoology and that your chairmanship happened at a kind of critical junction in the history of biology on campus, particularly in L&S, in Letters and Sciences, because that was the time of the reorganization.

And so you morphed from the Chair of Zoology to the Chair of the newly established Department of Integrative Biology. Can you, I want to hold off talking about what integrative biology means as a discipline, but how we made that transition. Who was involved? What were the circumstances, what were the impacts in trying to establish a new department in the middle of renovation of the old Life Sciences Building and so forth? And you were the steward of that happening.

Marvalee Wake
Proving I am not very bright, but it was interesting. It was a challenge. No one had any idea of what the scope of the tasks would be, but that's why it was a challenge and it was something that a lot of us thought we needed to do. To very briefly summarize the background. At the beginning of the 1980s, there came the perception in the biological sciences, particularly the molecular-cellular end, that facilities on campus were not really adequate for the kinds of research that were developing in several different areas.

Furthermore, the several different departments of some kind of biology in the College of Letters and Science and in the College of Natural Resources and the biological scientists in Psychology and in Anthropology and Optometry and elsewhere all had research interests that were appropriate to be communicated with colleagues in a diversity of these other allied departments, and correlated with that, the equipment to do the kinds of research was in different places, had different accessibility and so forth. But in other words, biology had grown like Topsy, and there was a perception that reorganization would provide better communication, better organization in terms of facilities. And at the same time, this impetus, this wave, came about at a time when offshore oil funding that went to the state of California was dedicated to higher education building. So that was open to interpretation as well.

Jim Patton
There was also a competition for graduate students among these disparate departments that had faculty doing the exact or nearly the exact same.

Marvalee Wake
It was much more than a competition for graduate students. Some people in some departments felt they didn't have the identity that was appropriate to them because they were in a department of name X, while name Y was more appropriate to them. I think of a virologist in Zoology who might have felt better in Molecular Biology for identification purposes. So we had that sort of thing, definitely permeating it too. So Dan Koshland, then in biochemistry, the Department of Biochemistry and with a big voice and a lot of influence, joined with Rod Park, who had become the Executive Vice Chancellor, and they together led the promotion of the idea that there should be a reorganization of biology that dealt with faculty and interaction, new buildings and facilities, reorganization of equipment; and then, in other words, dealing with the teaching and research efforts in a major way.

And a panel was formed that started considering ways to do this. A small group of facilitators was

put together to do some of the initial thinking about what could be involved, such as a College of Biology. Well, in the 1960s, there had been an effort for a college of biology, and it was quickly shut down. So they had that point of history to look at as well. And they did. Well by the mid 1980's, they were convinced that there should be a reorganization. The only question was really how to do it and how to get people behind it. That, of course, was the crucial effort. Well, I, 11 years after I was regularized as an assistant professor, was asked to chair the Department of Zoology, as you say.

And I started in 1984. That was right when the major impetus for reorganization was really getting its legs. So we maintained that for a while. And then when after several town hall meetings among biologists at which the leaders of the movement really explained why they wanted to do and what they wanted to do came about, it became clear that it was going to happen.

Now, this met with some resistance, particularly among people in the Departments of Zoology, Botany and Paleontology. As I indicated, both Zoology and Botany had people who were all for it, and they were usually the more cellular, molecular or physiological developmental people because of the kinds of equipment and the kinds of interactions that they wanted to have. So they were for it, but the majority of those departments and paleo were resistant to reorganization. Both Zoology and Botany, and the most recent American Council of Education Review of Status of Universities and Programs, which we've all considered to be the most reliable one, had placed Zoology and Botany in the top three in the nation. And so there was an "if we're not broken, don't fix us" attitude. "We're doing fine." We were obviously in leadership positions. Paleontology was resistant because it was the last remaining self-standing Department of Paleontology at a university in the United States. The very few others that had existed had been absorbed by either geoscience or bioscience departments or the museums associated with those universities, or even outside.

So when while chairing Zoology, they, (meaning the EVC and the Dean--and I'll come back to the dean in a moment) and others like people on those boards that were doing the discussion, asked me to be the interim dean of the new department that had to be formed while chairing Zoology. Again, I'm not very bright. I said yes. Whopping challenge! I think we can do it. I think we need to be part of the reorganization. So I took it on and we had a great Dean then for the Biological Sciences. The College had gone to a four divisional dean system after having a single dean for nine years.

Beth Burnside was a wonderful Dean. She thought. She listened. She developed her own impressions about what valid goals could be met, and things like that. I remember many, many breakfast meetings with Beth and Gunther Stent, who would become the interim chair of what became the Department of Molecular and Cell Biology. So part of the effort of the Gang of Four and the larger panel with people like Louise Taylor from the Chancellor's office and you from campus and a few others were putting together was a way for the designation of faculty into what was perceived as three new departments:a department that was effectively the molecular and cell biologists, another department that was the ecologists, organismal physiologists, behaviorists, evolutionists, systemists and so forth. A separate department in the College of Natural Resources of Plant Biology and Genetics also emerged.

So sorting out the faculty was a ticklish kind of thing because the group knew almost intuitively where the majority of people fitted easily, of potential faculty members for these units. But they also, I think, quite correctly perceived that people had to be able to make their own choices. Faculty members, as we well know, if they're going to be participatory, have to know why they're doing what they're doing and how their goals fitted the overall goals. So that became part of the challenge too. And most people found a pretty good fit. There were a few that had to be sort of negotiated and a lot of personal decisions about where they wanted to go.

I think of one very distinguished person who was then in the Department of Biochemistry, we will, name names, Allan Wilson, who said he really would personally prefer to come to the department that included the evolutionary biologists. But he wanted at the same time to be sure that any and all of his students had a very strong background in biochemistry. So he chose to stay in molecular and cell, which was creating a division of Biochemistry, and that suited his programmatic needs in a way that he found comfortable, efficient and effective. And that was going on all over. Well, let me cut to the chase about the other part, the buildings. Because of this amount of funding available, from the offshore oil funding, two new buildings by the state, were proposed. One of them, the Life Sciences Annex LSA), now the Weill Building (LSA) and the plant biology and genetics building were almost completely funded from those funds and were brand new buildings. The third component was the renovation, the total renovation of the Life Sciences Building, which had only a small share of campus and offshore oil money, and the faculty committee in charge of the building was in charge of generating donations to make the renovation happen.

Those came about and the stories behind them are very interesting, but I won't go into them. But there we were. And the situation then by the time the departments were to come online in 1989, the two new buildings were done or just about done. But the renovation of the Valley Life Sciences Building (VLSB) hadn't started yet. So while we had been having as soon as the new faculty sets were established, they had been having their own meetings with the interim chairs, leading them and interacting with the Deans and so forth, to think through curricula. Oh, what kind of graduate program would be involved ? Just about everything you can think of that a department does, because the situation at Berkeley is that when you have something like this happen, you have a formal disestablishment of the departments that were in existence, and the establishment of new departments. And this became a nightmare in many ways.

Jim Patton
For many aspects, those other departments, either they had concordant space where they were together, the faculty together, or they had the existing buildings like Barker Hall, where all of those members had been together for decades.

Marvalee Wake
Just about everybody.

Jim Patton
Yeah, but for us, not.

Marvalee Wake
People in IB.

Jim Patton
Yeah.

Marvalee Wake
MCB had to move once, which was traumatic enough.

Jim Patton
But we, but we were, you know, when the department was formed, we were spread all over campus and didn’t have a home for a long time.

Marvalee Wake
And I will never forget the numbers.

Jim Patton
And you know.

Marvalee Wake
Our faculty were housed in nine different buildings on and off campus.

Jim Patton
At the time when we were trying to wrestle with issues of curriculum, commonality, what the undergraduate major programs were going to be and so on and so forth. How did you shepherd that? You know, because you were the head. You were the chair.

Marvalee Wake
Yes. And everybody wanted to retain what they liked about their current situations, of course. That's the way they saw they could continue their research programs, which were fundamental to their existences, their graduate students, their undergraduates, their teaching programs. How much disruption could be tolerated while we effected these changes?

Jim Patton
But the.

Marvalee Wake
And yes.

Jim Patton
The curriculum offered basically undergraduate major programs in their curricula offered at that transition period were basically the same courses in the same programs of the amalgamated department units. Right?

Marvalee Wake
Well that's right. But that was the result of a conscious decision.

Jim Patton
Yes.

Marvalee Wake
We looked at those and one major factor involved was that, of course, we had to grandfather through majors in the old departments while granting their degrees and developing the degree program for the new departments. So there was that factor.

Jim Patton
Okay. So that brings us to what the new department was going to call itself. It obviously could not be called, you know, the Department of Zoology Paleontology. Let's see, we had people from anatomy, physiology, and I don't remember what other units -- genetics.

Marvalee Wake
There were seven units involved.

Jim Patton
And so it couldn’t be called all of those names tacked together. So this is not a trivial issue as to how as to what to call oneself.

Marvalee Wake

It was a nightmare. And I felt like I was dancing on tables.

Jim Patton
And so we came up with the idea of integrative biology. And so explain to me how we got there as simply as you can, and how we came to realize what that name meant. And then we can go on and talk about what Berkeley's integrative biology program has meant to the larger community across the country and even the globe.

Marvalee Wake
Right. Well, there is not a compact answer to that question. And its timing is one of several years. The first question is more or less easy. How did we name this nascent department of whatever. The trend in the nation was if you were dropping zoology and botany and so forth, you went to ecology and evolution or ecology and organismal biology or something like that. We immediately when thinking about the name of the department and having a meeting, a faculty meeting about it that went through those names, but there was objection to every one that came up that named areas of research. The behaviorist said, "I'm not an ecologist, "the physiologist said. "I'm not an evolutionary biologist." And so everything, you know, everybody dug in their heels.

So by the time I called a third meeting to determine the name of the department, I said I would resign as interim chair. And I meant it if we couldn't solve this issue and get on to other substantive issues that we had to face. And I had proposed to a small group of people just in conversation that "integrative biology" would be a logical name for us because it worked at several different levels. The way many of our colleagues practiced their research and their teaching was in a manner that dealt with several of the levels of the hierarchy, so-called of biology.

So, we were being integrative. We were also thinking that by the amalgamated Biology 1 course and other efforts of that sort, several of our graduate seminars had become more synthetic. That was the word we usually used at that time. But "integrative", I thought, worked pretty well, and fortunately, you know, we girls are trained in how to plant suggestions, and it worked and few people started really liking it, they saw ways to go and they saw excellent ways of presenting it. So at that third meeting, I listed the three or four that had been talked about most and said, we've got to come out of this with a real name. And so I identified what I thought were the pluses and minuses of each of these, and I tried to be as objective as I possibly could. Well, to summarize, I'll simply say that almost unanimously "integrative biology" carried the effort. People saw finally where they fit into a framework that fit. And people like Bob Full, who was developing the "Full cube," which showed in three dimensions time space area of science and so forth, showed what the interactions could be and in fact already were. But the question then became, what does "integrative biology" mean, as you say?

Jim Patton
Because after we named ourselves, the rest of the country kind of looked around and said, what's that.

Marvalee Wake
Exactly. Furthermore, the people in the building next door, I learned from several colleagues, were calling us the Department of Leftover Biology. And that's what told me as Chair I'd better get on the stick and really articulate a set of principles that we in our various discussions had thought characterized integrative biology as a label for scope, but also for the programmatic effort.

The way to do research, the way to train, graduate and undergraduate students. We quickly learned that we couldn't train in all of integrative biology. We had to be centered in one of the subdisciplines, if you will, but we had to be providing the tools, the interest, the emphasis on

broader questions that required a more integrative and synthetic. I don't like the word transdisciplinary, but it's not too bad.

Jim Patton

Synergistic

Marvalee Wake
Kind of effort. So I started writing papers, one of which was entitled "What is Integrative Biology?" And I learned, to my surprise just a few years ago that the director of the Integrative Organismal Systems Program at NSF, the National Science Foundation, was having rotators read my papers on what integrative biology is, a part of the education of his senior staff. I don't like to take charge and spout off about it, but I did such things as organize a symposium on Toward an Integrative Biology for one of the annual meetings of the AAAS, the American Association for the Advancement of Science. And I drew a stunningly large audience of people who, as you say, wanted to know what integrative biology was, and I and others of my colleagues were getting it to. I'd be invited to give a research seminar at University X, and did so, and found that probably the main reason they invited me was when they asked the question, "How do you reorganize a Department of Biology?"

So part of it is it was an idea whose time had come. I have never said that we developed a new way of practicing biology because so many people were already doing it just without the label. But they've become ever more transdisciplinary, synthetic, whatever you want to call it, so that we didn't stop there. I think that's the critical thing, we wanted to extend it to an attitude about how to do science. And that's what I personally tried to present when I did these other diddly things, and some international.

Jim Patton
Studies show that. I mean, that leads us into another topic that you can chat about, which is that kind of promulgation of integrative biology as a theme of how to do science in a much broader context across not just across the country and different other universities that are thinking how to reorganize their biological sciences program, but as a conceptual framework for organizations that think about and organize biological principles writ-large. So professional organizations at both the national and international level and you've played a rather dominant role in many of those. I don't remember exactly how many professional organizations you've been the president of, but it's over half a dozen, probably more than that. So tell me about those kinds of experiences. How Berkeley fits into that, how you fit into that, and what the return has been for all the efforts that you've put into helping define integrative biology as a real discipline?

Marvalee Wake
Well, that's, of course, not an easy question to answer. My first point is, obviously, I didn't do it alone.

Jim Patton
Of course not.

Marvalee Wake
I articulated a lot of what we collectively had been thinking about and promulgated, and were experimenting with and trying to make work. But we didn't get a good start in some ways because we had this problem of having been decanted between 1990 and 94 into these nine different places for faculty. And we were managing 15 different building units, if you include the teaching labs and where equipment was stored and things like that and two thirds of our people having to move twice.

So we were dealing with that. We came online in 1989. I chaired it officially then for its next two years. How did we come together? We have to think about that too. I'm convinced that two things held us together as faculty: searches, where we could express what integrative biology meant and deliberately choose the people that represented it to us in areas that we felt we needed; and our departmental seminars. They became focal for us, and the faculty then, better than ever since, wanted to learn what each other was all about. So one of the things is simply sharing. But as I said, we didn't get everything we wanted. When Bob Full, who was doing our development of graduate student research support via NSF, came in for the third time with excellent reviews but not getting the funding, the program officer for NSF said "You ARE integrative biology. You're the model. We're trying to bring other universities up to your standard.' Well, Bob said he was flabbergasted. He looked at the program director and said, "We have an idea, we need funding to help put it in practice."

So my point is simply, we never got the equipment that would have been involved for sharing across disciplines, some subdisciplines, nor did we get from the University the .9 to 1 staffing ratio we had been promised, which would have been, would have allowed us to facilitate the teaching of students to use the equipment that we had planned to bring in. Now, this didn't hurt us in the long run, strangely enough, because the science has changed so much. Some of the instruments for which we've designated whole rooms now have desktop facilities for this. But that too is part of the point. How did we say that we could do this? What was integrative biology? Well, I mentioned what I and my colleagues were doing sort of within the US and the departments that they knew.

I had, also, my inane curiosity, gotten pretty deeply involved with an international NGO for the biological sciences. The International Union of Biological Sciences, founded in 1919, right after World War One, and designated, along with seven or eight other unions in science, for bringing together ideas about the science at the international level. And I started doing that in the late eighties too. I ended up being chair of the US National Committee for the International Union of Biological Sciences, and we were the group that introduced "biodiversity science" at an international scale.

The term had just come into being by Ed Wilson and others, but a US group presented it as a decanal theme for the International Union's research Focus, for a time. That effort resulted in the development of a program in biological diversity science called DIVERSITAS, which became the current International Platform for Biodiversity and Ecosystem Science, which is now run by UNESCO and a year ago, presented the report that biodiversity loss is present is occurring at a much greater rate than predictions had suggested.

So this whole thing has carried over and been part of this Union. Well, I then was elected Secretary General of the Union and it carried on the diversity stuff. But I was also, of course in the nineties thinking about integrative biology. So when the decanal theme focused on biodiversity ended, I suggested "Toward an Integrative Biology." One of the themes for the Union had been the unification of biology, because over the years of its existence, because of the growth of biological science, several new unions had spun off microbiology, for example, biochemistry and physiology is another union and so forth. But we wanted to find some ways of being integrative, pulling things back together. The big questions. Biodiversity maintenance is a big question. Climate change was coming into focus in many ways. So again, this became a venue for presenting the principles that we had developed at Berkeley for what we thought integrative biology as a way of doing biological science was.

And I loved working with that group, my international colleagues were fantastic people, major senior scientists in their home countries. One colleague was head of the Japanese Science Council, and he was able to bring some of these things together. Another was the then president of the Indian

equivalent of the National Academy of Sciences, first integrative biology in terms of principles and scope, caused him to change his own research program. He was focusing on heat shock proteins and Drosophila, you know, ever more responsibly working out what they were, how they worked. But he hadn't really been thinking of them in a population and environmental perspective, even though clearly he knew that was involved. So he changed his program. More than that, he changed he introduced integrative principles into the curriculum for Indian education K through 12, and higher education. So I have been appalled in the last two weeks to read that India has just dropped evolution from the curriculum! And so it waxes and wanes. But I think that not what started but became more codified at Berkeley has had incredible influence. There are departments and institutes of integrative biology all over the world now. Sometimes they define it differently than we do, but a lot of the principles are really there.

Jim Patton
As I said at the beginning, Marvalee, excuse me for interrupting, but as I said at the beginning, you have had an outsized impact on our discipline.

Marvalee Wake
Well, somebody has to be a voice. That was the way I pull things together. That's no big deal.

Jim Patton
There are lots of ways to have impacts. So Marvalee, we have a new Department of Integrative Biology that was formed in the early 1990s or late 1980s. And we conceptualized that name as a field of biology. And I would argue that your research and teaching programs are exemplars of that field. Integrative biology was small letters. Can you talk at all about how you visualize your program in that context?

Marvalee Wake
Certainly. Well, my personal research, as I've indicated, tries to study just about all the parameters of the biology and environmental relationships of the members of a particular amphibian lineage. But I must say that that research gained me for the lab national science support to do work largely on that lineage, but which allowed me to equip the lab for a diversity of kinds of research in evolutionary morphology. And to me, evolutionary morphology covers just about everything because you have to have the development, the structure, the function, the maintenance in order to live in the environment. So my graduate students, in exactly no case, have done dissertations on caecilians, the least well known of the amphibians. As an evolutionary morphology group, I encouraged my people to, yes, obviously have focal taxa that were appropriate to the kinds of questions in evolution and morphology and development and ecology and biomechanics and so forth that they wish to ask. But they individually, in selecting those lineages and knowing the equipment that we had in the lab and could provide for fieldwork, were able to engage in studies of their organisms that cross the lines of these level of the hierarchy of biology looking at, well, for example, one of my students did a lovely dissertation on the way three members of a lineage of lizards run on sand dunes, and they have little extensions on their toes that seem to increase the surface area for running. Well, they looked at the running itself. They used a high-speed video camera for field use that I purchased for this kind of work, largely for him at that point, just to see how it was done, what was coordinated. Then they backed up, looked at the bones and muscles. How did those differ from those of related lizards that just ran on the ground?

So that's the kind of example of the eco morphology that some of my students did. This would be side by side in the lab with a student, who for example, would be working on the development of joints in frogs and how they worked and that required, this was later in the career, when my lab was really good and had great equipment and all sorts of good things for this work. The evolutionary genetics of the way joints develop in embryos and then their function were considered. So my

students were constantly watching what each other was doing, hearing about the literature, the questions, the problems that they faced in this. And we'd have both formal and informal lab group meetings. But the key point is that we were being about as integrative as it's possible to be, because overall we were looking at a diversity of lineages, looking at virtually all of the aspects of the, as I said, the hierarchy of biology, from sub-cells to ecosystem and environmental relationships and how they interacted. What is an organism, what does it do?

I consider the organism the center of the hierarchy. But in order to understand the organism, its behavior, its everything, we have to look at all of the expressions of what makes it work, and then how it *does* that work? So that's what we've tried to do in my lab and I've tried to maintain that as a focus, not just the branching out, but the conceptualization, that being an integrative biologist is an attitude about how you do biology, research in biology.

You think broadly, you're centered on fairly big questions. Part of the research program is breaking those big questions into some questions largely answered at different levels of the hierarchy in order to understand the organism. So by doing that with a group of students engaged with different organisms and different pathways of exploration of their development or their locomotion or their biomechanics or you name it, you were and we thought and they still think, creating an environment that simply typified integrative biology, parts of it, different lineages, of course, one does it differently.

As I've also said, we didn't invent integrative biology. What we did do was identify it and sort out the differences among ways of practicing the science of biology. We developed one in which the attitude required looking more broadly and bringing what we found at different levels back to a center of some sort so that we answered a larger, more inventively, enterprising, if you will, kind of question. And that's where the functional similarity came in. And I also have to take a bit of a step back. My summer funding on my NSF grants, which the work had to be related somehow to the caecilians that were, hey, those animals that funded the lab basically, I could work with my students on problems that were within their frameworks of interest such as feeding morphology, they'd be working on lizards or frogs.

So we'd look at caecilians; that broadened their scope of the literature and the scope of the techniques that they were learning to do their own work. So again, at several levels within the lab, working with the techniques, the materials and the ideas, we were trying to be integrative, giving students a broad range, broad understanding, of the scope that they could employ.

Jim Patton
So I'm interested Marvalee and in seeing how you convert your, your lab group of integrative biologists into your teaching program. Because I know that you taught a number of courses that are also quintessential examples of the kinds of courses offered in that department. Would you expound on that at all, please?

Marvalee Wake
Happy to. Well, the main course that I taught throughout my career was right in the area of my research interest as well. Comparative anatomy is part of most colleges and universities, and for many years it was typically a course that was very descriptive. And one looked at the bones and cartilages of, say, a shark, a salamander, a lizard, maybe a bird, perhaps, and a cat. And these stereotypical animals were considered the key representatives of major vertebrate groups. So we'll look at how their morphology changed in each of these typical members of lineages. Well, that descriptive way of doing things to me was not comparative and evolutionary and integrative at all, because these were usually treated as separate components and separate animals. There was just not the opportunity to try to put it all together.

So obviously with the opportunity to teach what would be for me a new course, I thought quite a bit about how to do that. What did I really want to see? Obviously I wanted it to encompass all of the typical components of morphology of vertebrates, but in a way that allowed us to take the pieces of an organism and build that vertebrate animal, put it all together, and at the same time to be broadly evolutionary and broadly comparative. One of the key things that I thought was missing in most comparative anatomy courses was comparison within and across the diversity in lineages. That was just not thought of. Also because at the same time, I was coordinating the revision of an old but good textbook, I tried to put some of these concepts together. What did I want to see in the lab? What did I want to see in the lecture? How did they mesh together? Should they? They don't at some colleges and universities because of the way that it's taught. Well, I wanted it all together, not surprisingly, I guess. So I put together what I called an evolutionary and functional vertebrate morphology course that started with a discussion of the phylogenetic relationships of vertebrates.

And that means what characters or characteristics do we use to organize and think about the relationships of these organisms and at the same time how those organisms through evolutionary time have changed. So what I did was sort of the standard work-intensive framework of 3 hours of lectures a week, two 3 hour labs a week, a one hour discussion section each week that had demonstrations and so forth.

But I also required that a project be done with living animals, which we had in the lab in order to look at how things function, and a term paper. And I'm happy to say that probably over the years, half a dozen of those undergraduate student term papers ended up being published. So my great Berkeley students were really doing intensive work, putting the information together and doing a little bit more work to result in a publication about the structure and function of the organism given the question they were asking about it.

So what did we do? Well in the first place, I did retain the framework talking about bones, muscles, nerves and so forth. But at each building point I tried to integrate why do we need muscles in order to say anything about bones and vice versa? And I did a lot more neuroanatomy and biology, the huge coordination center that's so often left out of morphology courses to this day, in fact. But that was part of the fun of putting it together. And I had a strong theme of vertebrate development in the course and that, as my students periodically reminded me, wasn't in the textbooks at all. Well, it was. And it certainly is now in most textbooks they have. The way of teaching the course has become more integrative and as I did this and as we developed the projects which required students to take their textbook and lecture knowledge of bones, muscles, nerves, locomotion, you name it, feeding, whatever, and given a list of living animals that we would have available to them, they were to select two animals, two different animals, and generate an hypothesis about how differences and similarities in the bones and muscles and nerves that they had learned about allowed those organisms to function. So for two weeks in the course, there was utter chaos as the students paired up, did their animals running and walking and swimming and so forth. And strangely, apparently, people began to hear about this because I began getting invitations to workshops on how to teach evolutionary comparative morphology.

So something was happening and it was putting these things together. And as I say, just about everybody does it now. The backbone of phylogeny and evolution and looking at development, structure, function across the variation within and across lineages of vertebrates is what I think comparative anatomy is all about. So that's what we did. And it's still growing and changing and growing. I brought in a lot of that year's original literature and so forth.

So my students said it was tough, but boy, was it good, except for the few that said, “Why are you criticizing my English in my papers? “And I said, “Because it's the tool of communication for

evolutionary biologists." That's the way I taught that course. And I used a similar framework for teaching comparative reproductive biology, basically the same framework there. Living animals in the lab, histological sections of their organisms so we could look at different levels of structure, but always putting the organisms together. And I also did a stint in Biology 11, the non-majors' course for undergraduates, and a number of freshman and sophomore seminars and graduate seminars at least one a year largely on morphology topics varied. For some time, my distinguished colleague Mimi Koehl, a superb invertebrate biomechanics person and I co-taught a graduate seminar, so we were always both in my own interests but together, and in my collaborations with my undergraduates, my graduate students, the graduate students who were GSIing courses and my colleagues on the faculty. We were trying to express modes of integrating the sphere of biology.

Marvalee Wake
Well, I was thinking the way being at Berkeley and some of the service that I've done at Berkeley and then my role in a number of national and international societies, which mostly cycles back to including integrative biology, has operated. Being at Berkeley made it happen.

Jim Patton
So Marvalee you mentioned the quality of Berkeley the typical Berkeley student is one of the driving forces in the way you organized and taught. And I completely agree with that assessment. But can you give us kind of a larger view as to what Berkeley has meant to you as a professional and how you've used your experience here to kind of spread the gospel on a larger stage as a result?

Marvalee Wake
Ok, certainly. Well, being at Berkeley has obviously facilitated my research. My teaching. The service that I have done at Berkeley is partly my way of giving back to the institution that has been so great in that facilitation. It has also taught me so much too. In the first place, I like committee work. I like meeting colleagues from other departments and other areas of the campus and learning about their perspectives on what a university is and what we can try to do for it.

Being on Graduate Council, again facilitating, and being Associate Dean of Letters and Science early in my career, and in fact doing the undergraduate service function helped me to understand what undergraduates at Berkeley have to deal with and how we can help them do it. It was a major part of this, but also being at Berkeley gave me -- across my forehead -- the sort of Berkeley label.

And I have to say I'm reasonably certain that that caused me to be selected for some very interesting things, like taskforces and commissions and advisory committees and things like that. All of which if I see that I have something to contribute to them, I like to do. So, for example, I was a member of the Smithsonian Science Commission which examined all of the science units under the aegis of the Smithsonian Institute, Institution as a whole.

Our report included 54 recommendations, of which I think approximately six may have been enacted. But it was an interesting exercise and one that seemed a profit. But why was I on that commission of 13 people from across the nation representing all of the areas of science that the Smithsonian does? Why me? I liked it. I got into it. I ended up being a subcommittee chair, but ... but that's part of the Berkeley influence. To another example, when the American Museum decided to promulgate its own self-standing Ph.D. program, they needed for New York State accreditation an outside Advisory Committee. Who were the members of that? A colleague from Harvard, a colleague from Yale and me, Berkeley, a public school, West Coast. Different kind of biology than the other two. So it was a privilege and an honor and an interesting way to be selected for work. And it was, I think, Berkeley promulgated. Similarly, one of the main areas in which I've been involved has circled back rather more specifically to integrative biology. After we became known for having come online with a framework and I was writing the publications about what is

integrative biology, and I wrote other ones, about a dozen publications calling it the nexus of parts of biology.

One of the things going on in general, as so many areas of biology were developing in terms of number and techniques and equipment and so forth, was somewhat viewed as a fragmentation of biology. Some molecular people were not talking to ecologists. The vocabularies were rather different. Well, we needed more integration in order to think about larger questions, and that's what governments were asking for, including ours. So what was going on? Well, I became involved in several, one of which the formerly American Society of Zoologists changed its name to become the Society for Integrative and Comparative Biology. And my wonderful, lifelong coordinate, shall we say, David Wake was a president about four years before I was of that society. And we got things started on more unification, more integration. I became president a couple of years after the name change, but when we had a management change and created several new divisions within the society, all to promulgate better integration, we now have a division of botany in the old American Society of Zoologists. It's about time.

So we've I've been involved in things like that and even more so in the International Union of Biological Sciences. It was created in 1919 as one of four or five unions following the end of World War One to promote communication about the sphere that it represented among the nations of the world. It did that with a slow start. World War Two interrupted it in very big ways, but immediately following World War Two, the big change with the United Nations and UNESCO resulted in much more activity for the International Union of Biological Sciences, among others.

And because of the changes in biology, other unions of more specific content were spinning off of the biological sciences like microbiology, like physiology, like psychology. So there was also beginning to be some concern about the splitting off. How do we deal with biology as a sphere? Well, the international union in the Biological Sciences developed decanal programs. It was highly international. Each of the nations that was a member had a national committee. I was appointed to the US National Committee and got involved in it quite thoroughly and this was at the end of the 1980s. A funny new word was cropping up in biology, then called biodiversity. So the US National Committee, because the end of the decade of the tropics was approaching, submitted a recommendation that the next decanal program be one in biodiversity science.

What is biodiversity? There was already fear that we were losing many of the components of the biodiversity and it was clear that there wasn't much understanding of what bio diversity was and what it provided to the world in essence. So the plan presented by the US National Committee was accepted and I was getting involved in the international part of it too.

I was elected Secretary General and stuff like that, and we kept the biodiversity program increasing and I'll cut that part of the story short by pointing out that as we developed an international framework for looking at urban to domestic to regional kinds of biodiversity issues, questions and problems, we were also pulling together major spheres. Now the biodiversity program for IUBS, gained several partners of the Committee for the Environment, and two or three others. Microbiology came in. But again, there was a sort of a dynamic query of what biodiversity was. A major part of the world thought it was ecosystem function. Another large part of the world thought it was looking at the organisms, finding out more about them and how they worked. How do you put that together? Well, you do exactly that. You put it together, bring folks together. You have workshops, you have symposia. So we did this on an international scale and it worked quite nicely. I'll close that by saying that our biodiversity program resulted in what is now a IPBES, the International Platform for Biodiversity and Ecosystem Science that is sponsored by the U.N. and just put out the report on how biodiversity is being lost according to all the ways that we were worried about, except the fact that it's proceeding much faster than the predictions. I'm still engaged

with the International Union for the Biological Sciences, that their work is continuing and continuing.

They're looking at gender issues now, they're looking at climate change, and so forth, but in as integrative a framework as can be developed and a transnational one, not just transbiological one, and I'm pleased to have watched all that happen. And I think it's Berkeley that allowed me to be able to be engaged in those kinds of things.

Jim Patton
I'd like now for you to talk about how your teaching program, your classroom teaching program, as well as your interaction with undergraduate students. In particular fit into this model that you have in the way you develop your graduate program, the integrative nature of that and, identify the courses that you taught and how they fit into that world.

Marvalee Wake
Because as I've said, I really enjoyed my teaching particularly because I really enjoyed Berkeley students; they're terrific. They're rich, they're greedy, they want more. They keep coming back for the kinds of things that interest them. As I was regularized and as things developed, I was asked to teach the comparative anatomy course because the person who had been teaching it for some time had retired.

The person hired to teach the course was a behavioral biologist who quickly became very engaged in teaching in the behavioral biology program. So it was sort of a natural hand-off to me to do that because of my interests.

Jim Patton
So Marvalee, maybe we can wrap up. Let me start back and say you have so much to tell about your influence on this campus that is worthy of other people listening to. But we can't we don't have the time for everything. But one area that would really be useful for me and I think many others would be how you and David as an academic professional couple were able to maintain both your camaraderie at home, raise a son who is also an academician, and yet have independent but collaborative research programs and how you worked together, and were able to work independently of one another. What does it take for a couple like you to be as successful as you've been? Or is it just simply a matter of the combination of the pair?

Marvalee Wake
Well, it takes, I think, just understanding and sharing and supporting each other's ideas about independence and what works well. And this applies, you know, from the kitchen and the yard to the kinds of things that we both did internationally. Finding sabbaticals together was a task sometimes, and Dave would do half of a sabbatical doing field work while I was writing, and then we would both go to a different place and learn their techniques.

So we worked out various kinds of patterns, but I think the key things are just we really liked each other. We could talk about almost anything and it was happy and joyous much of the time, pragmatic, often. But we sort of understood each other and when to support and when we could go off but then circle back. We did lots of things geographically independently, field work was one. Dave's efforts were extensive and in the field, in Central America, in California, we did some in Europe, the Vietnam trip was an interesting one, but also laboratory things elsewhere. And both of us, Dave in particular, asked to give talks and plenaries and all those sorts of things, but it was always good. We knew we could go away, we'd have great interactions and then we could come back and talk about them. And those comparisons and developments were always; independence can be refreshing rather than inhibiting.

Jim Patton
And I also know from personal observation over the last over 50 years or thereabouts that you treated each other as equals in everything -- remarkable.

Marvalee Wake
And that didn't mean we had to agree about everything.

Jim Patton
Of course not.

Marvalee Wake
I think we disagreed in faculty meetings. I think civilly, but it was clear that we had different impressions. So we were comfortable doing that. I think that basic comfort factor, that basic understanding, you know if you're responsible, responsible about what you're doing and saying you have a rationale for presenting whatever it is and it can be joint or not. We only had one research grant together. It was post-retirement and it was the largest grant that either of us ever received. It was a collaborative NSF grant and worked well. We have different graduate student groups and different and combined sets of postdocs and just all across the boards. We always treated both of our sets of graduate students and in-lab undergraduates as an extended family.

And so it was a lot of the part of the fun. Our son treats his set similarly. I'm hedging around, but I don't have a good focal logic for it.

Jim Patton
Well, I think like everything in life that involves individual people, it's the people themselves and one role model doesn't fit any other role model. It is what it is. You're fortunate.

Marvalee Wake
I think we had enormous respect for each other.

Jim Patton
Well, that's I am going to say, you know, we're of a generation that were brought up with having respect for everybody around us. And so if you do that, you're more likely to, well, I don’t want to get into that, but you're more likely to have a respect for your spouse.

Marvalee Wake
I also want to add in this somehow; that part of the reason that I've done a lot of service is because I believe in giving back to the institutions that have supported me basically. But also I’ve learned so much. I like knowing how institutions and people function. I like the breadth of collegial collaboration that I’ve been able to enjoy and some of the odd experiences. If you were serving on the selection committee for MacArthur Fellows taught me what thinking out of the box really can mean, funny little things like that. But they’ve made me, I think, I hope, a more perceptive scientist and person and working with people.

Jim Patton
Yeah, I guess I would argue the greater the breadth of one’s global experiences only helps as you deal with individuals and individual circumstances. So I don't know if we should end here or not Marvalee, but if this is the right time to end. I want to thank you so much for spending the time with me this morning, and thank you incredibly for what you have done for me and all of our colleagues over the many decades since we both arrived on campus.

Thank you.

Marvalee Wake
Thank YOU, Jim.