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OCEANOGRAPHY: THE MAKING OF A SCIENCE
People, Institutions and Discovery

Transcript of the Videotape-Recorded Interview with
JOE REID

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Interviewer: Ronald Rainger

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JOE REID

February 17, 2000

Ronald Rainger,
interviewer

[Note: Tape 1, Side 1 is blank.]

[Begin Tape 1, Side 2]

Joe Reid: And there wasn't enough variation in those years, '49 through '56, to account for anything. Then after, into '57, I guess I published my first paper on the California Current, using only the late '57 data. We didn't have the '58 data in. And all of a sudden, the temperatures went up like that, 158, and that is what made John Issacs and Elton Sette, of course with Roger Revelle's full support, call the El Niño meeting that was held in Rancho Sante Fe in '58 or '59, I've forgotten which.

But there were enough other places where one could get data of some kind or other, shore stations, islands stations, to show that it was not a local phenomenon, but all along the coast of South America and North America and a great part of the way across the Pacific.

RR: So that's the real first study by the large number of scientists of the El Niño effect on a broad scale.

Reid: Yes, and that, of course, had a simpler effect because Jerry [Jerome] Namias and Jakob Bjerknes--Jerry was in the long-range forecasting part of the Weather Service at that time, and Bjerknes was a professor of meteorology at UCLA--looked into it, and their interests in the worldwide effect of the winds and ocean temperature upon their weather forecasts was very much increased. At first they hadn't had much data from ocean winds or ocean temperatures to work with. They'd ignored it.

I do remember one fellow we hired back in the fifties, an elderly fellow at that time. He was forty-eight, very elderly when they hired him, had been working for Pan Am for 20,000 dollars a year, and my salary at the time was probably 5,000, whatever it was in those days, but he wanted to come and work for 4,000. Was he a drunk or a hop head or something like that?

Well, the answer was that he'd been forecasting for Pan Am for about five years on that Pan American flight from Los Angeles to Tokyo, and the strain was pretty bad, because what's-his-name, Juan so-and-so, the owner of Pan Am, would fly along once in a while, and this fellow had to make the flight himself once a month.

This fellow, once we got him, we had him looking at surface temperatures and looking each monthly pattern and how it varied from the previous and how much it was different from the average, and he told me that he sure wished he'd had these maps of surface temperature when he was forecasting weather for this plane flight. The point is that at that time, they were not able, they didn't have the information and probably didn't have even the idea of using large-scale

information of that nature. Weather forecasting was, I think, a small-scale business--this part of the state, that part of the state.

RR: So you're saying that the El Niño had an impact.

Reid: Yes, it did, far beyond its own significance. That is, people had been studying the whole ocean, not just El Niño years, but all years, ever since.

RR: CALCOFI and MLR don't really save the sardine--

Reid: No, the sardines went their own way.

RR: So why did the program--I mean, the program continues even to this day.

Reid: Yes, that's right. Now it's considered a climatic study, which it is, that if we can really see what's happening, [unclear] and others are pointing out that there is a general warming and a general decrease in zooplankton on the long term. Long term isn't so very long, about fifty years. But it's had ups and downs in between. Whether it's going to turn out next year, I don't know. But at least this is, of all the places in the world, I think, the best documented picture of what is going on in over in the area of the ocean this big, down to 500 meters.

RR: It sounds like a major contribution of the whole effort.

Reid: And a lot of people are using the data now who thought it was no use at all ten years ago, you know. The word "climate" has come into fashion now, and people are writing proposals to do climate studies who had never heard the word "climate" before, you know. That's where the money is.

RR: That's absolutely right. Earlier you mentioned--I don't think you referred to the NORPAC Expedition by name, but you played a very major role in the mid-1950s, 1955, [unclear].

Reid: Well, yes, I coordinated the NORPAC and the Equapac. [Interruption.]

Yes, I proposed both of those, and, mind you, it was much easier than one would have supposed, in the sense that all the ships in NORPAC and Equapac were doing essentially the same sorts of things they wanted to do anyway, but they were doing them in different places, and they recognized the problem of the large-scale view. It's not that you had to persuade somebody that this was a good thing to do. They had just had to persuade him that he could fit it into his regular scheme without hurting his work.

RR: What is NORPAC and who all is involved?

Reid: Well, NORPAC was, I think there were fifteen or sixteen ships involved, three from Scripps, one from the Bureau of Commercial Fisheries, one from the University of Washington, one from the Canadians, one from the Fish and Wildlife Service in Hawaii. And the rest of those--that's about six, isn't it? The rest of those were all Japanese vessels. They got together and did a station pattern, and everybody went out and did his work. It was just unbelievable that something of that scale could be carried out without more fuss.

Now, the Japanese were, of course, at that time, I suppose, depressed economically and slow getting back into relations with the rest of the world. They may have had a political reason for thinking this was a good thing to do also. That may have pushed it a bit.

RR: I've read a little bit on it. I wonder, don't the Japanese in that period of time start to do a fair amount--expand into tuna fisheries?

Reid: Yes, they certainly have done that. They've always had fishery outfits there. In fact, they did fishery studies back in the 1930s. As a matter of fact, I was looking for data on the Okhotsk Sea, and I found some data the Japanese had taken in the Sea of Japan in 1942, during the war, a terrible place to be. It was the winter, I think, up there, and they were out collecting the data anyway. And there they have continued their work also.

The trouble is that there's been a change in the fifties and early sixties. I knew a lot of Japanese oceanographers doing the same sort of thing I'm doing, but that generation has not been replaced. They are more into geophysics and into modeling. You don't get very many papers on the ocean itself from them anymore. That's a trend that's gone away.

The British and Germans have gotten back into it now. After World War II, neither Britain nor Germany nor Scandinavia was able to do much in the way of oceanographic research. The Germans and Scandinavians invented physical oceanography, but they were out of it for about ten years or more, but they've gotten back into it now. But the Japanese have never come back. The great names in Japan, Michitaka [Uda], [Kanji] Suda, and so forth, have just not been replaced.

RR: I'm wondering to what extent people here in tuna fisheries, like Wib [Wilbert McLeod] Chapman, Elton Sette, who is at that point with the Pacific Oceanic Fisheries investigations--

Reid: That's right.

RR: --they're interested in deep-sea tuna at this point, and I'm wondering what extent did they see the Japanese sort of as a threat in terms of building up their tuna industry by the mid-fifties.

Reid: I have no knowledge at all about that. I mean, they must have been thinking about it, but that wasn't my bailiwick of thinking in those days, and I'm not a broad enough thinker to have picked it up by osmosis or something. What acts of villainy they plotted, I don't know.

[Laughter]

RR: No, I don't mean villainy. But I'm wondering, I mean, aren't the issues about fisheries, and particularly tuna, a component of NORPAC?

Reid: Well, yes. All of those people, all of those ships that went out there were dealing, had dealt with, and generally did deal with fisheries problems. The Canadians in particular were concerned with the salmon, of course, and the Japanese with everything that was out there. I suppose the University of Washington was concerned with biology, but not necessarily fish at the time. They had a smaller department.

RR: Did you know Chapman?

Reid: Yes. Oh, yes. Chapman and Shafer. See, there was a sort of group that formed immediately after or during the NORPAC planning. We called ourselves EPOC, the Eastern Pacific Oceanic Conference. Met every fall. And again, that was when the directors of institutions were really the monetary bosses, and they--that is, Roger could direct the Scripps

vessels to NORPAC or Equapac and [John P.] Tully could direct his ships to this and Dick [Richard H.] Fleming again received the money for this sort of thing. He could do what he wanted with it.

That lasted for, oh, the meeting went on--I was temporary secretary of that conference for eighteen years. Elton Sette was chairman. But the whole structure altered during that length of time. That is, saying the first one was 1954, eighteen would be '72, wouldn't it? By that time, the directors didn't have much money anymore. It all went to the myrmidons beneath them, like me. And therefore they couldn't have as much influence.

What we could do at EPOC, we could favor some action of the Navy, for example, creating the National Oceanographic Data Center. We had some influence in persuading they ought to do that. Other resolutions we would send to congressmen, particularly the congressman from Washington whose name I can't remember right now. Well, you know who I mean. Cheerful, chubby fellow.

Anyway, there were people there. Actually, fisheries people attended, as well as biologists and physical oceanographers and Wib Chapman and Benny [Milner B.] Shaefer, and, of course, some rather reasonably high level of state and federal officials came because they were afraid if they didn't come, Wib and Benny would steal something from them. [Laughter] We had a couple of admirals from the Navy. I remember Margaret Robinson playing poker with an admiral there to get some more money to publish her atlas of surface temperatures. That was a jolly period. But it changed after that. That is, this group couldn't have that much influence.

It's continued under that name, but it's simply a scientific meeting, mostly of physical oceanographers now. It still meets there.

RR: [U.S. Senator] Warren [G.] Magnuson.

Reid: Magnuson, yes. "Maggie."

RR: Very influential. I wonder, too, I know that some of the Japanese, like Dr. Suda, who was one of the ones involved on the Japanese side, had some concerns over some of the CASTLE tests that took place in '54 and that period, and wanting to know about diffusion of radiological or radioactive materials. Is that a concern and is that a component of some of the work that was done through NORPAC as well?

Reid: No, it was not at that time. I think the major bomb things had not called so much attention to this at that time. Scripps, through ONR [Office of Naval Research], did have people monitoring this. Ted [Theodore R.] Folsom here was collecting fish guts from everywhere in the Pacific to look at their cesium or strontium content, whichever it was. That was the only funny thing, during the student disturbances in the Vietnam War, when everybody on the upper campus thought Scripps was making poison gas or nuclear weapons. A committee was formed to find

out if this is so, and of course we had to--was the federal government through its grants influencing the things we worked on? And of course the answer was no.

ONR, in particular, why, people liked ONR a lot better because you could ask for anything you wanted and you'd get three or four years' support. NSF, you got only one year or two years' support like that.

But I remember at one meeting Ted Folsom, this collector of fish guts, was called up. He was an older fellow at that time, and they asked him--we had to ask him, "Now, does ONR ever tell you what you ought to do and what you couldn't do?"

He said, "Yes, they told me I couldn't look at fish guts from the Atlantic, that they belong to Vaughn Bourne [phonetic] at Woods Hole. But Vaughn took everything he could get wherever it came from, and I took everything I could get."

And they got madder and madder and began to damn Hans Suess who was one of the certain radioactive people, interested people. Suess, he claimed, had come into his lab wearing a luminous watch at one point. Finally blew his stack and just left. I looked at the student member. What's he going to react to this sort of thing? And he said, "What a grand old man." I decided maybe the world is going to survive after all. [Laughter] [Interruption.]

RR: One of the things that you just mentioned in talking about Folsom and the fish guts is that ONR--well, it's sort of an issue about what is ONR funding and why. Some people have said that, well, certainly ONR is very well known for fundamental research and support of

fundamental research. What's your view on the idea that--is it all fundamental research, or is there some mission-driven aspects to ONR?

Reid: Well, ONR has a lot of mission-oriented research which it carries out under the Navy auspices, of course, and MPL [Marine Physics Laboratory] undoubtedly is doing things for the Navy, for Navy purposes, but ONR in general, the great public thought of them as just giving money for anything that sounded interesting.

RR: And what about the scientists? You said the great public, but did the scientists generally view it as not mission-driven as well?

Reid: Yes, that's right. I don't know what part of the money they have put in and are putting into their own military research directly carried out by people employed by the Navy as to what they're putting out, for example, at the Marine Physics Lab and other places which are civilian-operated and not Navy employees, but the amount that's given to just the rest of us who are not promising to catch submarines thereby, but just want to find out what's going on in the world, this was a blessing. I think the days of that are over because the times have changed. I wouldn't want the Cold War to start again just for the sake of getting more money out of ONR, but I'm not so noble that I won't complain. [Laughter]

RR: In some sense, your work isn't really in acoustics, but ONR did lots of funding of acoustics, and in some ways acoustics, underwater acoustics, is mission-driven, as you say.

Reid: Yes, that's right. Well, you see, the data I take are not acoustics per se, but the temperature of some of these column things I do from top to bottom in all parts of the world fit immediately into their maps of acoustics signal at depths and so forth.

RR: Maybe not so much on NORPAC--I'm not certain of my timing here--but a little later, I think with Equapac and some of the others, the funding is partially ONR, but they are interested in radiological uptake. I wonder was there funding from either the AEC [Atomic Energy Commission] or the Armed Forces Special Weapons Projects on any of these? Do you know?

Reid: I'm not aware of any. I know what we were doing on the Scripps ships in NORPAC. It had nothing to do with that.

RR: Were you on Equapac?

Reid: No, I wasn't on NORPAC or Equapac. We had four ships out there, and I had to keep beating them back to sea with a club, you know. The [unclear]. [Laughter] With one ship, I would have gone on it, but with four, I just stayed there.

RR: So you weren't actually out on the--

Reid: No, no. I had to deal with rearranging some station patterns when they had trouble at sea, but that's all. But I could do that better from the shore than out there.

RR: Let me, if I may, read you this quote, the quote that comes from Revelle. It's you talking to Gordon Lill and Art [Arthur] Maxwell in a letter from '55, and it's sort of talking about Revelle. This is pertaining to NORPAC, and it said that, "Dr. Revelle feels that we must somehow break some of the younger people," meaning the Japanese, "free from the traditional path of classical oceanography to which the Japanese have adhered. They should be allowed to meet and talk to people in their own fields from this country and, in a sense, be educated away from the traditional methods of [Koji] Hidaka, not only for their own good in the long run, but for the good of oceanography and for our own best interests."

Reid: Who wrote that letter?

RR: This is a letter from you.

Reid: Did I write that stuff?

RR: But it's referring to Revelle.

Reid: Well, what was the purpose of the letter, now? That wasn't it. I must have been trying to sweeten him up for something or other, don't you suppose?

RR: I don't know. But, I mean, does he have an interest? Is this really the case with Japanese oceanography, that people want to move the Japanese sort of away from Hidaka into a new oceanography?

Reid: That doesn't fit the context of my thinking now. It might have then. That is, I had the greatest respect for Hidaka. I did not ever mean to say anything to demean him. He was a man before his time. He was the numerical modeler before computers. If he were alive today, what he could do with--oh, it's unbelievable. Well, he just had to have three dozen graduate students making all the calculations for him.

I don't what I had in mind. Maybe, "Just for goodness sake, let's talk to the Japanese more," was perhaps what I meant. Maybe what I thought was that they were being directed too closely by the heads of their departments as to what they should do and weren't being given any freedom. I don't know what I meant by the newer kinds of oceanography at the time. What was that? '55?

RR: Yes, it's you referring to Revelle's views, in a way.

Reid: I see.

RR: It's saying Revelle wants them to be moved away.

Reid: All right. Okay. Curious. I'll have to--Wow. Gordon Lill. All right, who else was there?

RR: Art Maxwell.

Reid: Art Maxwell. Yes, that's right. Well, so far as the ONR funding for NORPAC was concerned, I didn't know anything about it at the time. That must have been part of those ten technicians that were used on NORPAC. In other words, I have never been on the money end of this. The only money I've ever dealt with is the money that I get from my grants. I know where that goes to, of course. But, technicians, the way Roger had fixed it, you need technicians, you get technicians.

RR: I guess I'm wondering to some extent were there connections with the Japanese oceanographers. You said that Japanese oceanography, after Suda particularly, didn't continue--

Reid: Well, it lasted, I would say, about ten years after that. Then the thing that happened was the old ones died out--Hidaka, Uta, Suda--and were not replaced. And the brightest one of the younger ones was Koseyoshida [phonetic], who died at a much earlier age and the whole 1971 or '72, but again he was a wonderful theoretician. But their descriptive oceanographers just disappeared.

RR: But there are good relationships established between--I guess beginning with NORPAC and, afterwards, between Japanese and American oceanographers.

Reid: Yes, there were. I had excellent relations with the people I've mentioned there, but of course, there aren't any such people anymore. So my relations with the Japanese are much reduced. I know some of them and I see them, but they're in different fields. I'm doing the same thing. I see them at AGU [American Geophysical Union] meetings and the like.

RR: I know on the--I may not be pronouncing it correctly--the ZETES expedition--

Reid: Yes, that's right.

RR: But there were several, again, I guess, Japanese [unclear]--

Reid: Well, actually the ZETES was the first part of it. Boreas, the second leg of that, was what I was on. That was an ONR-funded cruise. As we were working close to Japanese waters, they weren't [unclear], of course. In the Gulf of Alaska, why, I invited a Canadian, alan Dotameade [phonetic], and a Japanese, whose name I will think of in a moment, to go along. That was a winter cruise in the Bering Sea and the Sea of Okhotsk, and it was kind of fun. Well, you saw that picture of ice I showed. That was ice on the *Argo*.

RR: Last week?

Reid: That's right.

RR: After NORPAC, what are some of the other--Boreas you mentioned. What are some of the other expeditions that you were on?

Reid: Well, let me see. I can't remember them all. Boreas was one of them, and then down to the Antarctic and over against the Philippines. I can't even think of it. I should have brought a list of the cruises. Their names escape me. A hundred-and-some in the Atlantic and some in the Norwegian-Greenland Sea in winter. There was the Hudson cruise, we call that one. It has a number somewhere along the line, Hudson number such-and-such.

RR: Were you on the Indian Ocean Expedition?

Reid: The International Indian Ocean Expedition. No, I was working in the Pacific at that time. That was in the middle sixties.

RR: What are some of the major findings that have come out of your work on these various expeditions?

Reid: Well, let me see. I'm trying to figure out what's known now that wasn't known then. The Boreas expedition, I'd written a paper saying that it was the kind of water that you find, a salinity minimum over much of the north Pacific Ocean that does not come from the sea surface directly, is not formed at the sea surface, but it's formed by a diffusive mixture with the overlying colder, less-saline water. And it extends as [unclear] minimum well into the Pacific. Other people had argued that, no, it has to be formed at the surface. So I went up there in winter and found that it wasn't at the surface. People are still unsure about it. They found one little bay in the Okhotsk Sea now they think might form some of it. I wrote that paper in 1965, and if it takes that long to refute it, why, I'm home-free, am I not?

And then another interesting one was--what was it called? I've forgotten. The one I showed the illustration there, near Samoa there's a deep passage, the deepest passage between

the south Pacific and the north Pacific is near the Samoan Islands. It gets down to 5,000 meters, and clearly the water's going northward through there because all the cold water is down here and it sneaks through, and we put some current meters down there and measured that. That was late 1960s, with very primitive instruments, but they've done it again with first-class instruments and done a great deal more than I did, but at least the results I got are consonant with those.

Let's see. I can't sort out what other major results of the expeditions. Well, see, I have a different approach in the sense that when I go to sea, or when I went to sea, it was not to take a line of stations for a particular purpose, but to fill in gaps in the general array so that I could map the large-scale circulation. For that reason, why, I can make my data available as soon as it's processed, because if they want to write a paper on that section by themselves, that's okay. It doesn't bother me. I have other things in mind. Other people hold onto their data for a long while. It's not that I'm more generous; it's just that I've got a different agenda.

RR: You've done the large-scale circulation for all the major oceans.

Reid: Well, I'm not through with the Indian Ocean yet. It's the worst of the lot.

RR: And you're still working on that?

Reid: Yes, that's right.

RR: This may sound like a rather odd question, but do you find your work to be driven by theory or more by observation or sort of a combination of the two?

Reid: It's mostly observation and a little theory, because the theory is--it's a very complicated system, and you get theories or little pieces of it, but they don't cover the whole thing. We're getting better on that now, but we have certain notions come up which are approximately true. The Sverdrup transport, we can calculate from the wind stress and it's something like reality. It's very much like it, but it's not complete. It takes only the winds of it, it doesn't deal with the thermal helium down below. The Stommel-Arons [phonetic] model, is, again, perfectly correct for the ocean it describes and has a great deal in common with the real ocean, but isn't enough in itself.

Nobody's yet been able to find a way to combine all of these principle ideas to get the right results. It's tough. So mine is mostly observation. That is, I'm trying to show what is going on. Now, why it's going on, I'm interested in, of course, but I can't wait to "why," because "why" is a very complicated answer. My purpose really is show what so the "why" boys can get a chance to reason properly. If this is going on, then why? The other is to say, "Well, what ought to be going on down there in general?" and start from first principles. That's a very complicated business. It's hard to do it that way.

RR: So you would describe your work primarily as descriptive physical oceanography?

Reid: Yes, that's right.

RR: Are there a lot of students these days still continuing to go in [unclear]?

Reid: No, there are not. There are a few, but descriptive physical oceanography is diminishing because it's so much easier now to do numerical models, I think. At least they think it is. Some of it is. You know, a student comes here, wonderfully brilliant in applied mathematics and physics and so forth. Does he want to spend three years learning something about the ocean, or can he start right in with a good model and solve that in a few months and get his degree? It usually takes longer than that anyway, and frequently it's not a very useful model.

RR: So there are no requirements in--

Reid: No, we don't tell them--

RR: [unclear]?

Reid: Well, we sort of encourage them to, but some people never go at all.

RR: Is that relatively recent, since computer modeling, or does that go back--

Reid: No, there have always been theoreticians around, and there's no real advantage in their going to sea. They're working on abstruse principles, and you can't really see what's really going on in the oceans just by being on a ship. It's not as simple as that.

RR: I assume with your kind of work that--maybe this is a wrong assumption--were there ever any issues about classification?

Reid: No, I never had any classification problems. The work I was doing mostly was in the open ocean. I'm trying to think. Other people I know have had some problems. In the early days, one of the students at Scripps was a Canadian, Hugh McClellan, and he went to sea in the Bering Sea in a summer cruise on a Navy vessel and worked. When he came back, the data were classified and he couldn't even have a copy himself, you see. That's about as absurd as you get into.

RR: But even the soundings and things, when did you [unclear]?

Reid: Well, we do soundings routinely, in other words. That's the difference between Scripps and Woods Hole. We run the photometer all the time, and everybody stands watch, making sure so that every time we go across an area we know what' the depth, and this is combined into maps.

The only classified work really that I ever did was on the Wigwam test, bomb explosion off Baja California. That's right. I'd forgotten that part. Well, I didn't really do anything there. I just went along on the ship, and when the bomb went off, it was exactly the same sensation as when that same ship had hit its bow on a sand bar [unclear]. It was just a big thump, and that was it.

RR: When was Wigwam? Mid-fifties?

Reid: It wa a few hundred miles. It was in the fifties, I think. I don't know just what time. Late fifties, I think. Obviously not a big thing in my memory, because, as I say, I had nothing to do except be out there and make a few measurements of temperature and salinity, and then they took all the pieces of papers away from me because they were classified, and that's the last I ever heard of it.

RR: So you never able to find out [unclear]?

JR: No.

RR: You weren't on anything with Redwing, I assume.

Reid: No.

RR: That's more [unclear].

Reid: The Navy hasn't used me very much for classified work at all, except for that. In fact, I didn't have to be Navy to get on the Wigwam. I don't know whether they don't trust me or what, or don't think I'm smart enough.

RR: You participated with the GEOSECS [Geochemical Ocean Sections Study] activities, and I wonder if you could say a little about what the purpose and the objectives of that were.

Reid: Well, the original of GEOSECS was that Henry Stommel and I were-- [Interruption.]

The state of geochemistry in the middle 1960s was that Wally [Wallace S.] Broecker was measuring Carbon 14 from one sample in the north Atlantic, and Hans Suess or somebody was doing one sample in the South Pacific or something like that, and it seemed not enough data to work with. Henry and I were on a cruise from Australia all the way over to Chile, and we talked

a lot during the period. By the way, Suess and Broecker were using different methods, so they weren't even sure the results were [unclear].

We were preserving the Aristotelian unities. That is, we had time, place, and personnel all on the same ship, same people, same reagents, same tools. And even if our results were biased, at least they were uniformly biased. Actually, they were good. And why couldn't the geochemists do something like this? Henry and I thought of, well, how about a north-south section from the Aleutians down to the Antarctic to where they could collect a few stations and look at the shape of this Carbon 14 and so forth, and tritium and helium, and decided that Henry, whose prestige in the field is unmatched, I think, when he got back to Woods Hole should talk this out among the geochemists. And they did, and, of course, they took the bit in their teeth.

We did it in all three oceans in a screwy station pattern, but it all worked out.

RR: GEOSECS was over a long period of time.

Reid: It took about three years, I think. Yes, the Atlantic first and then the Pacific and then the Indian.

RR: And in what ways did it advance? Obviously it's more refined, I guess, and more extensive.

Reid: Well, again, mind you, you must make allowances for my situation here. It seems to me the things that they measured, the various isotopes, have not told us anything more about the sense of flow in the ocean at any depth because their patterns really look very much like the oxygen patterns or nutrient patterns. Well, they do have a time number on them though, so we learned something about the time scale which we could not get from the other quantities. But it was well worth doing, I think. Geochemists actually bought it off. I thought they never would. They are such a contentious bunch, I was afraid somebody would get thrown overboard at sea or would stop halfway up the gang plank and say, "I'm not going with that guy," things of that nature. [Laughter]

RR: This is a little out of sequence in some ways. Did you participate in any of the IGY [International Geophysical Year]?

Reid: No, Scripps' part of IGY was mostly studies of the Ecuadorian undercurrent in the Pacific. John Knauss did that. Scripps didn't have a big chunk of IGY. Woods Hole tried to repeat all the meteor sections.

RR: So you weren't on *Downwind*?

Reid: No, *Downwind* was [Edward] Goldberg's cruise. I wish I could think of the names of my cruises. Boreas--well, I'm seventy-seven and I'm entitled. I've been a couple of dozen of these things, you know.

RR: I'm sure. This is a question from Naomi [Oreskes], who says that she heard that even to this day Harmon Craig and Wally Broecker don't get along because of GEOSECS.

Reid: Well, I didn't think they got along before. I don't know why it is that geochemistry attract so many cantankerous characters. They'll not all cantankerous. Some are very gentle. I thought perhaps it was because their field was so new and they had to be so competitive, because if you told somebody of an idea you had, it was just an idea, but, in principle, he could write it up and send it to *Nature* the next day, and so you didn't want to do that.

Now, that doesn't work in my field. It's a more mature field. That is, of Bruce Warren told me about an idea he had, it wouldn't be practical for me to steal it because he got the idea. He must have worked on it pretty well all the way through before he ever gets around to mentioning it. I would have to go to work right away and he'd probably get in ahead of me anyways, so why bother? Besides, I got my own ideas and so forth. [Laughter]

RR: One of the things about some of the expeditions that you've been on and helped to organize, such as NORPAC, people talk about it as promoting good international relations in

oceanography. I wonder if you could comment on that, as oceanography and oceanographic expeditions as floating international--

Reid: Well, we've been well received in various ports. Unfortunately, when I come ashore somewhere at the end of a cruise, I mostly want to [unclear], so I don't usually spend much time there. I did spend some time in Chile, and once in Hakadati at the end of the Boreas trip. The mayor of Hakadati had a big banquet for the officers and scientists. There were geisha girls and all sorts of fancy things. Then he made a speech, which I was supposed to answer. He made a speech about how clever they were. They got rid of all their sewage in Hakadati by putting it in the Chuchima [phonetic] current, which carries it right out into the Pacific Ocean.

Then the U.S. consul there said I was supposed to reply. [Laughter] So I got up. I don't know what I said, but I suppose it was taken in kind. Maybe his English wasn't good enough, but I couldn't--yes. They were lovely geisha girls.

RR: I'm wondering, before you step up onto land, I mean, just among the oceanographers themselves working in those sort of multinational, multi-ship kind of [unclear].

Reid: Yes. Well, we have somebody from a foreign country along, especially if we're going to do work in that country's waters. Occasionally it's somebody that you don't really need at all,

and most of the time it's somebody you can really use. You're getting a free man from this sort of thing, and that helps.

I had to spend some time on the Ivory Coast trying to get clearance. We were starting from the Ivory Coast, and they hadn't given us clearance to work in their waters, which they claimed for 200 miles. Well, I wanted this station to start right there. We fussed and bothered, and finally on the morning I went in there, trying to tell the captain, "Look. Why don't you do it anyway? We won't write it down, write down the latitude until we're well out of range."

Well, what they wanted to do was take along an observer and let him off in Cape Town. I wasn't at all sure that I could be responsible for a black man from the Ivory Coast getting safely onto an airplane back from Cape Town to Ivory Coast. But finally they solved the problem of our clearance. "We thought we'd already given it to you." I guess they were just teasing us or something.

RR: That is an interesting issue, because in the fifties I think of it more, I guess, with Latin American countries, there were these efforts, Ecuador and Argentina, trying to claim 200-mile territorial waters and not wanting warships to know about their continental shelf. Did that ever enter into--

Reid: No, not that part of it, but I was working off the south tip of South American once, and we'd left from Montevideo and wanted to go back into Buenos Aires, except Chile and Argentina

almost came to war, so we couldn't go into Buenos Aires. We had to go back to Uruguay. They are nasty about this.

Sorry, I keep coming back to the Boreas. It sounds as if that's only cruise I was ever on. That's not so, but there was an interesting problem on getting into the Okhotsk Sea in early 1966. February, I think. Because the U.S.--

[Note: Tape 2, Side 1 is blank]

[Begin Tape 2, Side 2]

Reid: On the Boreas expedition, we wanted to go into the Okhotsk Sea, and we didn't think there was a place where the islands were wide enough for us to get through without encroaching on their territory. On the other hand, the State Department implied they would defend us up to three miles, but I didn't want to be defended up to three miles. I didn't want any defending going on in this business. And we couldn't ask their permission to go in or communicate in any other way. So at some international meeting, I gave a copy of a station pattern I had, where you were coming along and over by Kamchatka we would go in and out and in and out and in and out and then into the Okhotsk Sea and back again and so forth, and said, "By the way, I'm going to be working there," on the assumption that he would pass it on to whoever it was necessary.

Apparently they did, because as we got out about the third zag in, why, a Soviet vessel showed up alongside us and stayed with us the whole trip. They would lie to. You know, we'd stop to put a cast over, and they would lie to on the active side and watch.

The weather was very bad until we got into the Okhotsk Sea. That was the place that I thought was most dangerous in the sense for icing up. We'd iced up pretty badly in the Bering Sea close to land, but the Okhotsk was different because it would be completely ice-covered in the northern part. The winds would be coming down from there and coming up this water and picking up super-cooled and hitting the ship, and we might get more ice than we'd like. However, the wind dropped when they were in there. In fact, it was a bright, sunny day, terribly cold, but quite a sunny day, and we were lying there. There was ice in there. They would be wide floes. We would break our way through, and this Soviet ship, which was smaller than we were, would followed through. We considered going through one and stopping there while it closed up so he couldn't get through, but we decided not to.

Anyway, at one stage we would wave to these people. We decided we'd like to trade with them, so we thought we'd give them some cigarettes and some *Playboy's* so maybe they'd give us some vodka. We put this stuff in the boat and the captain and one of the ship's officers, Ski. He was Polish. We thought he might have had enough ability to talk to them. But as we got under way, and it was clear that we were going over to them, the ship got under way in at a tremendous rate. They almost swamped us, and they almost ruined their engines, the black

smoke coming out of there. Apparently, the captain's orders did not cover a situation like this. So I don't know whether that did anything for international relations or not.

RR: You said you'd been on many expeditions. One of the questions that we've asked a number of people is the role of women on expeditions. I wonder if you would comment on that. Had you been on any expeditions that included women?

Reid: Oh, yes. They began very early. I don't know, it was 1950 or '51, on the CALCOFI cruises, Margaret [K.] Robinson and June [G.] Pattullo went along, and there was no trouble there at all.

I did express once an opinion that got me in trouble. Everybody remembered that one. That was later on when some lady with a six-month-old child wanted to come along. If the kid gets sick when you're 1,000 miles at sea, what are you going to do? Apparently the word got around that I didn't want women aboard. Well, I've never had any real trouble with them at all. I used to worry about it till it happened enough.

I was thinking, you know, all sorts of things go wrong at sea. At the end of a long cruise when the food is not fresh anymore and you've had everything the cook can cook, he's apt to take a meat cleaver and start to chasing people around. Well, there's a solution to that. Just stay out of his way for a little while, and he will feel sorry and do the best he can for the next meal.

However, I expressed my doubt about the other side of it to Sir Edward Bullard, who was a geophysicist who was here. What are you going to do if you've got a woman at sea and she starts crying? That always embarrasses a man in some way. I didn't know quite what to do. And what Teddy had a quiet answer. "That's all right," he said, "you just invite up to your room and give them a drink of rum and pat them on the fanny and they'll be all right." Well, with Teddy that would have worked, you know. But I wasn't sure it would have worked in my case. [Laughter] But I've never had one cry.

RR: With the CALCOFI, those are state-sponsored. What about on ones that were sort of ONR, Navy-sponsored? Were women allowed to participate?

Reid: Oh, yes. I think there's been no restriction on women on NSF or ONR-funded things. The last cruise I was on, down toward the Antarctic, it was little too early to get to 67 south, there were at least two women aboard. One of them was a Scripps graduate student who has her degree now and is working up at one of the other universities of California.

Oreskes: [unclear]?

Reid: No, she was before this cruise, yes. No, her name will come to me. She was known as "the princess," because she's a slight, slender, nice-looking young lady, and she was working on

her computer most of the time on a big stool, and they had to put a couple of pillows on top. I went to the galley and said, "Have you got a pea?" She said, "I've got a split pea." So I lifted up this thing when she wasn't there and put a split pea under it. And a couple of days later when I got back, why, the pea was gone. So she must have been a real princess.

Oreskes: Was it Marcia [K.] McNutt?

Reid: No, it wasn't. I saw her in San Antonio. I'm no good with names anymore.

RR: This is probably since the seventies. I'm assuming before the seventies--

Reid: I can't tell you where it was everywhere. But I know that at Scripps on the CALCOFI cruises and some others--well, in fact, Roger's cruises in the Pacific back in the early fifties--

RR: The *Capricorn*.

Reid: *Capricorn* and so forth. Yes, they had women. The CALCOFI cruises had women. Even women technicians, they've probably got some now. The NSF-funded thing, *Scorpio*, we had at least two

women. Of course, that was on a big ship, and there were even women in the crew in the steerage department. But then the last one I went on was a Woods Hole vessel down at the Antarctic, and they had female officers, in fact, at least one. It's also true that the other officers disapproved of this female officer. They didn't want her there. They wouldn't talk to her.

RR: You mentioned Margaret Robinson a couple of times, and I would still assume that the CALCOFI would be day cruises only.

Reid: Oh, no. They'd go out and stay out for twenty days or something like that.

RR: And she was on some of those?

Reid: Yes, right.

RR: Since World War II, the relationship between oceanographers and the Navy and the government has led to oftentimes lots of oceanographers being on committees with military people and often with government sorts of people. I wonder what sorts of committees you played a role in.

Reid: Well, I used to be on several in the old days, but I'm not a good committee person. I think I did some good here and there, but somehow I was always saying the wrong thing. I couldn't figure out the hidden agenda soon enough to go along with it or to oppose it properly. I never meant to be a politician.

RR: So you haven't [unclear].

Reid: I'm on all sorts of committees. For example, I'm on nominating committees for the president of AGU and for things like that. But the committees that meet in Washington for NSF, for example, I haven't been on one of those in several years.

RR: Did you ever have the sense that it had a good or a bad impact?

Reid: Well, it seems to be necessary. After all, when you consider NSF and ONR, what their mandates are, and that they're carried out by human beings, they have both worked out incomparably better than you would have expected. All you need is one jerk in either one to give you real trouble. [Laughter] Or

they're listening too much to one particular congressman, for example. They have to to some extent, but it's been limited pretty much.

RR: Are there projects or activities in your career that you wanted to do and didn't get the chance to do, or were you really able to do most everything you wanted?

Reid: A very few things. I wanted to go back to Okhotsk Sea with a bigger ship with an icebreaker in the wintertime, but never managed it. The only icebreakers that were around were the Russians, and they liked to have their ships in February down on the equator. That fell through.

I think the limitation, if any, is mine. I've often thought, considering what I have done, why didn't I start some of it earlier and get farther? It just took me a while to shake down into the route that I'm following. I wonder how many other people feel that.

Of course, there are differences in fields. You must have heard that people who do well in mathematics and physics are supposed to make their mark by the time they're twenty-five. I don't know if that's really true or not. I guess Galileo finished

his final and most important book when he was sixty-seven. He'd been working on it for ten years. But there are other fields where pure cerebration doesn't come into it, but they're informational fields. Certainly part of biology is one of those things. Mine isn't an informational field at all. I have to think very hard about what it's like down there, and I have to remember it as well, then look at it again if I need. And it all come together, or it doesn't come together in my mind somewhere along the line. But it's based on information, not just on ideas.

RR: My last question is, what should I have asked you that I haven't?

Reid: Well, I don't know. Seems to me I've introduced extraneous topics in from time to time. Well, you haven't asked me what I think of the future., tank goodness, because I don't have any idea about what the future is. So I don't have to waffle on that one.

My worry is about funding in the next ten years or so. [unclear] I won't be for that whole next ten years. But with ONR having to put its resources into other things and the number of oceanographers growing beyond the funding for it, it's going to be very awkward for some people.

RR: By "other things," I guess you mean more sort of the littoral work rather than the blue water.

Reid: Yes, that's right.

RR: That's been a feature of the nineties. Has that already had-

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Reid: Oh, yes, it's happened. ONR stopped supporting me about four or five years ago. NSF picked it up, so I'm not in trouble.

As I said, I'm not going to start the Cold War again just to get funding. No.

RR: We hope not. Well, thank you very much.

Reid: My pleasure.

[End of interview]