

Bahcall, John N. Date: November 3, 1983. Interviewer: Paul Hanle.
Auspices: STHP. Length: 1.5 hrs.; 30 pp. Use restriction: Open.

Dr. Bahcall recounts his scientific biography, including work at CALTECH, changing interests from physics to theoretical astronomy, and joining the Princeton Institute for Advanced Study in 1971. He describes his involvement with Space Telescope Phase B planning, especially his advocacy of a photometric scientific instrument and the "serendipity mode" of ST camera observations. Bahcall concludes with an extensive discussion of the astronomers' 1973-77 lobbying campaign on behalf of ST funding, covering such topics as Congressional attitudes toward ST, the shaping of an astronomers' consensus in favor of the instrument, tactics and argument used in lobbying congressional staff and representatives, and the key astronomer participates in the effort

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Interview with John N. Bahcall
by Paul Hanle
Space Telescope History Project
November 3, 1983

Dr. Hanle: I'm with Professor John Bahcall, November 3, 1983, and we're going to talk about his role in the Space Telescope. I'm going to start out with questions of general background and try to get up to the '74 period, convincing people that the Space Telescope should be supported. Could you say first when you came to Princeton, a little bit about your background before Princeton, when you came and why you came to Princeton, to the Institute?

Dr. Bahcall: Yes, I came to Princeton -- see, I check that on the basis of my children, so this is the 13th year that I will be in Princeton permanently. Then I was here 15 years ago for six months, 16 years ago for three months. I can check it all by my children. Something like that.

Anyway, I came as a permanent professor. This is my 13th year as a permanent professor here. I came to the Institute because it was a great place to concentrate entirely on research, which is what I wanted to do.

Hanle: Where did you come from?

Bahcall: I came from Cal Tech. I was at Cal Tech for eight or nine years.

Hanle: What was your position there?

Bahcall: Well, I went up through the ranks. I started off as a research fellow, and when I decided to come here, I was an associate professor. I was a theoretical physicist always at Cal Tech.

By that time I decided I really did want to do astrophysics and concentrate on it. I came to Princeton to the Institute because it was a place where I didn't have any other duties other than doing research and being stimulated by and being stimulating to young people. All those things were the things that I really wanted I wanted to concentrate on things related to research and not teaching and not committees.

A very important aspect was the excellent astronomical environment in theory here, and the closeness and pleasantness of the working relations between all the people in Princeton, astrophysics people, in Princeton. Another important element for coming here was just the prestige.

Hanle: I was just doing a little calculation. The first experience then, your permanent appointment, began in the academic year of 1970-71.

Bahcall: Yes, that must be right. Let's see. Dan was born in '71, so I accepted the appointment some time in probably the spring or summer of '70, but we didn't come in '71 until our son was born. We came probably in the fall of '71 right after he was born.

Hanle: What sort of scientific problems were you working on at that time?

Bahcall: It's hard for me to remember. I'm sure I was working on the solar neutrino problem. I always am, ever since I can remember. And I was working on quasar absorption lines, to a strong extent. During that year, I guess prior to that, I had been working on the attempt to identify observationally quasars that were in clusters of galaxies. That's one of the first observational problems, if not the first observational problem. I guess the first observational problem I ever did.

Hanle: But you were treating this theoretically, or you were actually?

Bahcall: No, I did a lot of observing, just the six months or so before I came to Princeton.

Hanle: Where were you doing the observing?

Bahcall: Palomar. Maybe it's the year before I came.

Hanle: Did your coming to Princeton have anything to do with the problems that you were working on also?

Bahcall: No, I think just the opposite. I would say, maybe from the point of view of the scientists here, it did. You know, I don't know what motivated the scientists here to invite me. But, from my point of view, I would say just the opposite. While I was at Cal Tech my work was more phenomenological than it would have been or has been here, even more phenomenological at Cal Tech, because I worked closely with some of the observers. The reason why I was doing this observing before I came to Princeton was I was worried about how I would do in an environment which appeared to be very rich in theorists but not very strongly populated in observers, and that was the opposite environment than I'd been used to and had been successful in at Cal Tech.

You will notice when we have coffee that there are no observers in the room, only theorists.

Hanle: Do you continue to do observations?

Bahcall: I did some observations from time to time while I was here at Princeton, mainly in Israel, where my wife and I made one important discovery, but primarily not. Princeton,

I do a little bit, associate with other people. But I decided some years ago that the best investment of my time was not in observation.

Hanle: Was the Space Telescope being talked about when you first got to Princeton in '71? Was it in the air, and did it have anything to do with your coming here?

Bahcall: It had nothing to do with my coming here. I'm sure I was aware of it, but it wasn't, as I remember, a dominant subject of conversation at Princeton. It was not a prominent topic of conversation.

Hanle: At Princeton.

Bahcall: At Princeton certainly it was much more prominent than any other place, but we didn't often talk about it.

Hanle: I'm trying to think, the state of the Space Telescope at that time was it was being talked about, but there wasn't a lead center, there wasn't a program--

Bahcall: There was a Phase A study, I think, that Nancy Roman was in charge of at headquarters, and in that a few people met and had some discussions, but it wasn't clear what its role was going to be or whether it would happen. I was not there. At that time I knew nothing about space astronomy and was not in any way involved.

Hanle: Then I won't pursue that. When was it that you became involved with Space Telescope, it began to rise in your consciousness?

Bahcall: Well, I think it was probably in '73. I remember a note from Bob O'Dell about it. I remember announcements that came either from Bob O'Dell or Nancy Roman, describing the potentialities of the telescope. I remember replying to that, reading those, thinking about them, replying to that, without any thought that I personally would be involved, but just thinking that it was a great program.

Hanle: This is the note that's in the file.

Bahcall: Yes. I think that's probably my first conscious contact with it. I just responded as a scientific citizen saying, "This is great, can I be helpful to you?" but not expecting it would be so catastrophically time consuming as it was.

Hanle: Did you know O'Dell before?

Bahcall: Very slightly. I think we'd met each other at a scientific meeting or two, but we didn't interact on science much because our topics were so different.

Hanle: That was January of '73, and by that time O'Dell was permanently at Huntsville. Huntsville was in effect committed to be the lead center and to develop the Space Telescope. Were you aware of O'Dell's role in the Space Telescope at that time?

Bahcall: Yes.

Hanle: I mean in the sense that he had really dedicated his career to it.

Bahcall: It's hard for me to remember what I knew then and what I learned later, and I believe at that time O'Dell had not, I'm certain Bob had not made the crucial decision to cut the ties to the University of Chicago. That was made quite a bit later, and I remember raising with him, I believe in a letter which he must have, the seriousness of that decision, and suggesting caution. But I admired much later what I learned about what he had done.

Hanle: So the note that you mention came to you in January of '73. That was in effect saying, we're going ahead with Space Telescope insofar as setting up a working group is concerned, and perhaps you'd be interested.

Bahcall: What I got was the general announcement which just described what they were going to do, and I suspect at that time I also was imbibing the scientific atmosphere that must have been around, the people talking a little bit about it, Astronomical Society meetings or whatever, and I just thought it was a great program.

Hanle: You characterized yourself earlier as basically a theoretical physicist.

Bahcall: That's how I was trained and my title at Cal Tech was always theoretical physicist. At Cal Tech you're professor of something or other, and my title was always theoretical physicist. The first astronomical course that I ever took, that I ever listened to, must have been in the spring of '72 when I gave a lecture course at Berkeley. I didn't have any astronomical background.

Hanle: OK, and then when you widened your interest to include astrophysical problems, still they remained largely in the theoretical area.

Bahcall: That's right. I'd say up around, from the time of '64 on, when I first got involved in, '63, I guess, '62, I guess I first got involved with solar neutrinos in '62, from that time on, weak interactions in stars and the solar neutrino problem I got involved in in '62, I believe. From that time on I had a non-professional's interest in

astrophysics. But from on the theoretical side.

Hanle: OK. Then I come to the Space Telescope in '73, and you found that was a very exciting program but basically an experimental program. How did you see yourself fitting in or did you see yourself fitting in?

Bahcall: I didn't see myself as having any obvious role to play there. There was the note by O'Dell which simply said, "maybe we should have some thinkers here also," and it occurred to me that that might be useful or might not be useful, but as the design of the instrument, since it was an observatory, should reflect the desires and the thinking of people who were not dedicated to any specific instrument, but whose only commitment was to the science as a whole. I thought perhaps I could fill some role there; perhaps I couldn't. It wasn't for me something obvious that I was going to do well or strongly wanted to do.

Hanle: I see. I didn't ask that question well. I meant, as a theorist somehow you found a major experimental program attractive and interesting. Is that because you paid close attention to major experimental programs, or are there other reasons why Space Telescope drew your attention, even though you were fundamentally theoretical?

Bahcall: I think it was just the greatness of the program, the potentialities of the program, independent of whether I was a theorist or an observer, which attracted me. I'd had, by that time, some experience in Israel, building up an observatory and building some equipment and developing techniques for observing and having observed quite a bit at Cal Tech in two or three years, so I know something about it and I was interested in the equipment, but it was the fact that it was a great science project, not the fact that it was experimental or space science or not theoretical or was theoretical that attracted me. It was the science that it could do which was so obviously great that I said, if I could be helpful, maybe I'd like to be helpful.

Hanle: Do you remember back in '73 when you were made part of the working group? Were there still alternate proposals being considered by the working group, other than an Orbiting Large Telescope? For example, was the lunar proposal, telescope on the moon proposal still considered by your group?

Bahcall: I don't remember that we discussed it seriously, but that may be censorship of the ages. Maybe that's post facto censorship. But I don't think that it was seriously discussed.

Hanle: There were several alternatives which I believe by then were pretty much put by the way. One of them was this

so-called ASTRA -- an acronym. I can't recall what it stood for. It was a space telescope, 60 inch size, a fairly small one. Had the size by 1973 been settled on?

Bahcall: Well, we were interested in a Large Space Telescope, and as we found later, and I strongly argued in a crucial meeting that was here in the board room at Princeton, we came down to the question of the minimum size that we would accept, as a NASA Congressional injunction to study that. I wouldn't have been interested in a moderate size program. I would have said, "That's wonderful, that's great," but there's no way I would have given up any of my research time to be associated with that. I came to Princeton because I wanted to have more time for research, and the only reason why I considered participating in Space Telescope was because it was going to me just an enormously, it was going to be a program which led to unpredictable breakthroughs, and I found that terribly exciting and worth the pain of not doing my own research a little bit.

Hanle: But only if it's a Large Space Telescope.

Bahcall: Only if it's THE Space Telescope. It was the fact that it was the best thing you could do.

Hanle: What was large by your definition, your group's definition?

Bahcall: I think a minimum of three meters was what we were talking about at the time.

Hanle: Were they talking about anything bigger?

Bahcall: I seem to remember that a four meter telescope was discussed, but not at the time that we, the time frame of '74 anyway. But there had been proposals for larger telescopes, as you know, earlier on. We occasionally batted around larger telescopes, but I don't think we thought of them in

...

Hanle: Can you guess roughly, bracket roughly, when you settled on three meters?

Bahcall: No.

Hanle: You can probably do that with correspondence. I don't know what happened in your involvement between January of '73 till the push for Space Telescope funding in the spring of '74. Would you try to sketch that for me?

Bahcall: Yes. I think one good source for that will be the minutes of the Space Telescope Working Group, Phase B. And let me say, from my personal viewpoint, there were several surprising aspects to my participation in Space Telescope.

First of all, I was coming in as a theorist, but I found that my input to the discussions was frequent, and I believe significant. My advice was listened to, to my surprise. I didn't expect to do much of anything there. In the scientific discussions, I also felt myself being more and more mesmerized by the greatness of the project.

Now, one thing which I see some reference to here -- probably the most information I suspect is in my correspondence file -- is one task that developed. I found that in the Phase B we were in at the time, there was no place for a photometer, simple photometer such as we now have for the Wisconsin photometry. So although I myself had never done any photometry, I drew up some proposals for photoelectric photometry with the Space Telescope, and argued successfully that that should be added as one of the instruments that we would be considering at that time in Phase B, and should be evaluated along with the others.

So I was appointed, or volunteered to be, or however it was, the head of a team which was in Phase B the photometry team. Now, I didn't know from beans about photometry, but I was the photometry team leader because I was on the working group and was the only person there pushing that point of view. I did it not because I had an interest or ability in astronomical photometry, but because it seemed to me a simple instrument which would surely work, and from which there would be great scientific payoffs, particularly because it was simple. So I represented that group's interests and got together a semi-team who worked to draw up the specs for that instrument.

Eventually, when I went off to Israel for a year, I got Ed Nather who'd been a friend from Israel to actually sign off on that, because he is a very well known and successful photometer builder and had built one at the Israeli telescope that I was at. Ed formally eventually submitted the specifications for the thing. In the early stages of the team, I was simply a conduit between my friends who knew something about photometry, and to the working group where I was representing the point of view of photometry, in the absence of other people.

Hanle: Is that specification the one that's included in the file here?

Bahcall: I presume so, if that's the one that Ed eventually signed off on. It was the report at the end of Phase B that Ed signed off on.

Hanle: There's a series of names. His is there, yours is there.

Bahcall: OK, but Ed was the man who, in my absence in Israel, promised to verify that the design and the specifications and the reports on what it could do were fair.

Hanle: So about when would you say you became leader of this photometry team?

Bahcall: It would be some time between the time I signed up and the time Phase B was over. You know, it wasn't very long, and I'm sure that the working group minutes will record that, and then I went off to Israel, and I managed to shuffle off as much of this as possible to Ed.

Hanle: When was Phase B over?

Bahcall: Well, we extended it I think until some time in '75 because of the delays in starting the program again, but I don't remember. I remember the crucial vote where we selected the core instruments and the other recommended instruments, and that must have been the last time we had any real scientific discussions.

Hanle: Phase B was the phase. These were cost studies that were being done as well as instrument definition?

Bahcall: It was instrument definition, discussions, often very interesting, very exciting, as to what the important science was and what kinds of instruments should do it. It was the feasibilities and general groping for how to make an observatory.

Now, I do remember again, one of the key things which I think I did --- it will be in my correspondence because I came across it a few years ago, and sent another copy or copy to Bob O'Dell -- that happened in Phase B, which was a natural thing to happen to someone of my particular background. It occurred to me that there could be lots of science done with what we call serendipity mode. Now, I argued we should just take a little bit of light from the other instruments which wouldn't interfere with the primary interest, and take pictures or whatever, and that was a point of view which was not well received in the working group at the time. I'm sure the minutes will reflect, and in particular was strongly argued against by Lyman (Spitzer), and I'm sure again our correspondence will reflect that.

I remember that Lyman argued against it on the grounds, which has some validity still, that there would be so much data that there wouldn't be scientists to use it, and we could never make use of 10,000 pictures a year, all of that, and it would be impossible to reduce.

So that was an argument which he made strongly at the working group.

Hanle: That sounds like an argument of embarrassment of riches. Did it come though at a cost to something, if you would take a little bit of that light off, did it cost something?

Bahcall: Well, everything costs something in the end. No,

the light comes at a different place in the focal plane so it doesn't take any light from the primary instrument but it's just, why bother to design an observatory which will have that ability, if you never make use of it, and it would be too expensive, and you can't reduce the pictures. That was Lyman's point.

So I then called Maurice Goldhaber, I remember clearly, it must be in the correspondence, and wrote Maurice, asking how many pictures high energy physicists could develop and process and study. And together with my wife, Neta, we prepared a series of scientific proposals, I think it was six or seven, which will be in the correspondence, that we particularly were interested in, and I remember studying galaxies was one of the early ones, where serendipity exposures would be useful in establishing a wide enough field sample, so that you could do statistical studies. And I remember arguing that it also would enable you to disseminate Space Telescope to small colleges and to places that weren't astronomical centers, who could then do forefront research with the serendipity pictures, serendipity science.

That was a key position which I advocated during Phase B. It was not always the popular one. But it was one I felt strongly about, and I'm sure it's in my correspondence and in O'Dell's correspondence too.

Hanle: Maurice Goldhaber, you wrote to. Why did you choose an elementary particle physicist?

Bahcall: Because Lyman and I had this argument at the working group about how many pictures you could reduce, and I knew that people working with cloud chambers and with high energy physics detectors reduced many pictures. I didn't know how many. I'd seen these girls scanning things and reducing pictures. You know, the technology was different then, but I wanted examples of that. I think I also called people at SLAC and other places. I remember discussing it with Maurice.

Hanle: These were doing the best data reduction one could, presumably.

Bahcall: The reason why I called these people is just I knew them and had heard about these things happening and knew they had a broad point of view, and I just wanted some facts to counter Lyman's argument. But I think the main counter was also drawing up this list of scientific proposals which I submitted to O'Dell and which I think was, yes, was submitted to the working group.

Hanle: This was during Phase B?

Bahcall: Yes.

Hanle: Now, it turns out, I think you said Phase B goes into

the spring of '75, which is actually after the political campaign that you mounted. I want to turn to that in a second, but I guess I want to ask, while you were in effect trying to sell the Space Telescope, you were also preparing proposals for doing science on Space Telescope Working Group, is that right?

Bahcall: No, I don't think that's correct. I didn't spend much time thinking about science that I would do on the Space Telescope. I would say none. Oh, I worried about making Space Telescope a generally useful observatory. The two things that I think I did scientifically in Phase B that I remember clearly are, one establishing a photometry team, since there was none, and two, proposing and justifying a serendipity mode of observation. But the examples I gave of scientific research problems in the serendipity mode were personal examples, together with my wife, only because that was the easiest thing for us to do. It wasn't that Neta and I would do these observations. It was, look at all the interesting things that two people can think of to do. It means that a hundred people can think of many more things to do.

Hanle: You mentioned your wife, Neta Bahcall. Could you characterize her role in assisting you or contributing independently, if that's what it was, to the working group in early deliberations on science of Space Telescope?

Bahcall: I don't think that she had a great interest in it. I consulted her and learned from her about problems that she was interested in in extragalactic observational astronomy. So therefore it was natural for me to describe, as one of the justifications for serendipity mode -- I don't have the memorandum before me now -- studying clusters of galaxies, because that was her major scientific interest. So I discussed with her how one might do that, and make up a catalogue, and I think we proposed at the time making a catalogue of ST observations of distant clusters of galaxies. Also I think we proposed using Space Telescope serendipity mode to search for supernovae in other galaxies, just like you do on the slide survey and so forth.

So I talked to her just because she was an intelligent knowledgeable observer whom I would consult about what you might do, who had an experience and interest different from mine, but she had no special interest in ST.

Hanle: I'd like to turn to questions about your involvement in the push to sell Space Telescope, and I guess the main point is, when did you first become involved in this campaign to convince Congress? Did you take it on yourself or perhaps did someone ask you to attempt to convince them? These are questions that are meant to allow you to sort of sketch it, if you'd like, but, why was it that it became evident to you that someone had to support and push for Space Telescope?

Bahcall: That I know about and it's in the correspondence, in the files --

Hanle: It's not in that file.

Bahcall: No, it certainly isn't, but it is here. I received a phone call from a friend in NASA. That was in December of the year that it was taken out of the budget, I guess. That would have been the end of December, '73. It was at a time when Lyman was on sabbatical leave in Paris. And I received a phone call saying Fletcher had agreed with the President to take Space Telescope out of the budget. That couldn't be known until January, but they thought that I as a vocal spokesman at NASA might want to make some use of that. I called around.

Hanle: Do you know if others were called also?

Bahcall: No. If anyone else was called, it was only one or two other people. I was called. It was not a legal thing to do, you know. At that time the budget was not announced, and so I knew that essentially no one else was called. If anyone else was called, it was only one or two other people, and I forget whether anybody else was called. I don't believe anybody else was called because what I did was then call some other friends at NASA, and tried to decide what to do.

I wrote Lyman a letter about it, proposing a Congressional campaign, and that may be in this pamphlet that Lyman and I, in the history part of that or some other place. It will be in the correspondence I guess. Lyman was in Paris at the time, and responded, and I'm sure his letter is also here.

That was all prior to the official public knowledge that it was taken out of the budget. I also remember being strongly urged by Nancy Roman at the time not to do anything, and to let the professional public relations people at NASA handle this matter. I'm sure if we had done that, there would never have been a Space Telescope, because NASA policy was not to support Space Telescope.

And in fact, NASA was dragged kicking and screaming to support Space Telescope, reluctantly.

Anyway, prior to the announcement, it appeared to me that I was a very well informed person about it, and uniquely close to Washington among the well informed people, had a lot of time -- I'd come to Princeton so I had a lot of research time, so I felt I had more time than anybody else. By that time I passionately believed in the program. And Lyman was absent in Paris on his sabbatical and wasn't due back until some time in January, I believe, so he wasn't here to take charge, so it was essentially me or nobody, I felt.

Hanle: Before you go on I want to ask some questions. The administrator agreed with the President that it should be

deleted in December, 1973.

Bahcall: Maybe even November or December. I think it was December, yes.

Hanle: Do you know why? Do you know if he defended it?

Bahcall: But I think what happened is that NASA's budget was being squeezed. Something had to give. He made a decision in ten minutes, I'm sure. If you'd talk to him. That's the way those things are. "You've got to take something out of your budget, Jim, what do you give up? You want me to cut you a million dollars, I'm going to cut you 100 million dollars, what's going to go?"

And he had to make some decision, and no scientists were involved in that. If any top level NASA people were involved, I'm not sure. I suspect that it may have been the moment of truth.

I don't know how that decision happened, but that's the way it was presented to me. It was well past OMB. It was at the time that the budget was brought to the President, maybe the President's Science Advisor said, "There's too much for NASA, they have to cut," and the thing that went out was Space Telescope. Completely.

Hanle: Do you know, was that to have been a first start proposal in 1973?

Bahcall: No, I think we needed at that time about six million dollars or so continuation for our studies. I believe that's right.

Hanle: That's right for you campaign for '74.

Bahcall: Right. And it was cut out. That would have meant that according to the agreement between the President and NASA, Space Telescope was dead, dead forever.

Hanle: We're talking about fiscal '75 funding, then.

Bahcall: Yes. And had that decision stood, there wouldn't have been a Space Telescope, and NASA administration was committed to make it stand. So it was clear that it had to be somebody outside of NASA who organized people to fight NASA's agreed-upon position.

Hanle: Was there anyone inside NASA, other than your friend who felt that the Space Telescope should be supported and who argued for it within NASA, that you know of?

Bahcall: In addition to the person who called me, there were other people who felt as he did that it was important, and should not fall by the wayside because of these quick budgetary priorities which had been established at the last

minute, and were willing to do courageous and illegal things to support that position and they did.

Hanle: Did they encourage you also?

Bahcall: Yes.

Hanle: So is it fair to say that you had a reasonably broad base of support within the space science office of NASA?

Bahcall: I wouldn't want to specify where they were in NASA, but it's certainly true that individuals then at NASA supplied me with useful information, crucial information, about positions of Congressional leaders, about tactics that could be used in order to support the program. I would discuss with them before I did anything in the community. You will see the results here of letters I wrote to the community. But I would discuss with my NASA friends tactics about that. I would discuss with them relative scientific priorities. I would in certain cases read to them letters that I would write, and discuss with them and they would tell me who was interested in what and who I might get to talk to, and none of that appears in the files, but it was a close collaboration between myself and several crucial people in NASA, very well placed to help us.

Now, in that matter, you're quite right in saying that Lyman and I had quite a complementary relation. In that matter Lyman relied upon me to make the connections with NASA. We discussed every word that I was told, and he would say, "Maybe you want to call A and ask him about this or that or see if he can be helpful in this or that," and I would do it. Nearly always, the activities that we were engaged in which could not have been public activities were my responsibility vis-a-vis NASA.

Hanle: And was he reluctant to get in touch with them directly?

Bahcall: No, he just felt that I'd established the channels of communication and spoke their language and was on friendly terms with them, so I could do that and he could do something else.

Hanle: I was going to not take issue but question, you characterized earlier some of this activity as illegal, and so far I haven't I believe, I'm not a lawyer and not in a position to judge, but I don't think that anything so far is at least any different from the way other offices in NASA work with their constituencies.

And I suspect that there's a certain, well, I wonder if I isn't perfectly legal to offer advice or information to people who advocate a program, so long as the NASA person doesn't officially advocate it?

Bahcall: First of of all, I shouldn't have known it. I'm very happy I did. And I was told that I could make use of it however I wanted, but I couldn't attribute it, and I didn't. But I did make use of it, and it was clear that the person who called me hoped I would.

Also, I think these NASA officials who talked to me were taking positions which were at variance with the position of the administrator, and that may not be illegal, but that can get you fired, and that's not generally good management procedure. They did that.

Also, we would discuss things, tactics about lobbying. NASA was forbidden from lobbying. NASA was allowed to inform, was I believe the word, to respond to questions. They were allowed to inform. They were not allowed to lobby. I was a lobbyist.

Hanle: What's the distinction between lobbying and informing?

Bahcall: I don't know what the legal distinction is, but it was clear that what I was doing was lobbying, because I was organizing people to write letters, to take whatever advantage they had of connections to whatever Congressmen or Senators they had, or to get me whatever political advantages they could afford, and to take advantage of whatever possible interest that we had and exploit whatever possible sympathies we had. That's not responding to any initiatives for information or inquiry, but provoking them from the outside.

That, NASA was not allowed to do. They weren't allowed to organize us, to have a write-in campaign. In fact they were opposed to it. And yet we flooded Congressmen and Senators with letters.

Hanle: Let's go on to that campaign. You did that in a series of letters. You mentioned in your files that you made two major trips to Washington, two separate periods, one in early July of '74, one in later July or '74. There must have been some activity going on before that, letters being written, calls being placed.

Bahcall: Oh yes. And I suspect that may even be in my correspondence files downstairs, too, because my secretary would be Bea Bilton at that time, and she handled most of that. At one time I just would go through the American Astronomical Society listing and called everybody I knew and asked them to write, and then I asked them to find people who knew somebody who would write, and I asked them their Congressmen and Senators' numbers and I'd get them to call everybody ... (off tape)

Side 2

Hanle: You organized everybody that you knew. Did you establish a kind of an ad hoc committee?

Bahcall: No. We were never organized. George Field was an active participant, George Wallerstein --

Hanle: Where was Wallerstein?

Bahcall: At the University of Washington. And Lyman was a very major element in that, so there were several of us. But we didn't have any committee. We didn't have any organization. We would circulate memos to each other, but most of the work was done by phone.

Hanle: And most of the coordination if not all of it, from your office?

Bahcall: Most of it from my office, but I would say that everything Lyman and I did, we did knowing what the other was doing.

Hanle: Was it fairly universally recognized among astronomers that you and Lyman Spitzer were the campaigners?

Bahcall: I think probably I was often regarded as the central campaign organizer, just because that's not Lyman's nature. You've met him. He's not pushy. You know that's not his nature. But Lyman was widely recognized as the scientific inspiration of the telescope. So every bit of information would ultimately pass through us, and people would tell us about what they were doing, but more often they would call me than they would call Lyman. I think that was true on the outside. At Princeton I think it was probably seen as more "you do this, I do that," but if somebody like Wallerstein had some information, he was probably more likely to call me than Lyman. But I think it was clearly perceived that we were the focal points, but I think it was also perceived that it was a national, almost spontaneous uprising. Every place that we talked to people, people themselves took the initiative and carried it forward, without any organization. Just the individuals themselves, once notified, once they had copies of letters so that they could use them as examples or knew roughly what we were doing, they carried the ball themselves independently.

Hanle: I wanted to go back to something that just struck me. You said that the President deleted the Space Telescope request. I'm a little confused and I wonder if you could straighten this out. Fiscal '75 funding, as I recall, there was a request in the NASA budget for Space Telescope studies, 6.2 million dollars, and that was the request that was deleted by Eddie Boland, Congressman Boland's committee. This is fiscal '75 funding. Then it was considered by the Senate. Are we talking about the same time?

Bahcall: I think so, but again I would have to refer to the

correspondence. I think the crucial letters would be the letters that I wrote to Lyman in Paris and the letter that Lyman wrote back to me when he was in Paris. That would describe what I was told at that time.

Hanle: OK, I'll check that.

Bahcall: It may well be in this pamphlet, history.

Hanle: So what you're saying is that the story about the December phone call and deletion of the request by Fletcher was really for fiscal '76 budget.

Bahcall: That's correct. Yes, that's described here. The July time frame was something that Lyman and I did together. Lyman was in the country at the time for fiscal '75. We went down in the July period together to Washington.

Hanle: Let me go back to the original question then. Do you recall what it was that stimulated you to become involved in 1974, the first campaign, in campaigning for Space Telescope support?

Bahcall: I think Lyman and I and Martin Schwarzschild, in some linear combination, discussed what could be done. Martin Schwarzschild had made sorties through Congress, together with Lyman, at the time that Copernicus was threatened. Less extensive but extremely effective. And somehow out of those discussions, it occurred to the two of us, Lyman and myself, that we were the logical people, that we ought to try to do something about '74. I don't remember the details of that. If I do I'll let you know.

Hanle: Do you recall if there's anything in your files that might indicate how you got involved in it, maybe a memo from Schwarzschild?

Bahcall: I rather doubt that there were any memoranda exchanged at that time. There would have been conversations, I'm sure. That was a time in which there weren't many other people around and Lyman and I both accidentally happened to be in Princeton, which was close to Washington, and most astronomers are no place that they can be reached in the summer anyway and don't have the time.

Hanle: Was that an unusual summer for you? Don't you usually go away?

Bahcall: I'm usually in Israel in the summer. Let's see, the summer of '74, July '74, let's see -- I don't know why I was here.

Hanle: I wondered if you planned to stay because ST was in trouble?

Bahcall: I don't think so. No, I don't think we knew that much ahead of time. It may have been that I was only here part time anyway that summer, but I was here for that July. I don't remember.

Hanle: OK, let me go on. You wrote a paper called "Summary of Conclusions Regarding --"

~~Bahcall: I think it was signed by Lyman and myself.~~

Hanle:

~~Bahcall:~~ Yes, that's right. "Regarding Points in Favor of Support of the Space Telescope." There were two of those actually. One was called "Summary of Conclusions" and the other was "Summary of Considerations." One was clearly an internal document in which you made three points about how one could convince Congress. The other was a document that you could send to people like NASA officials and Congressmen, in which you pointed out points in favor. Do you remember those two documents?

Bahcall: Yes, vaguely.

Hanle: I wondered when they were written in the sequence of lobbying in July.

Bahcall: I think they were written after we had had some fairly extensive exposure to Congressmen and Senators or their staff, and it was only at that period that we knew what their concerns and interests were, so that we could respond to them, and what the questions were that were being raised. So it was written after that. Then like most of the things that Lyman and I did, they would have been drafted on the train coming back from Washington.

Hanle: How many times did you visit Washington that summer?

Bahcall: I don't know.

Hanle: Five or less?

Bahcall: Yes, I'm sure, but I think my travel reports would answer that. I don't know.

Hanle: The reason I asked, one summary letter which I think you or Spitzer wrote indicated that there were two principal trips.

Bahcall: That's right. Two trips where we had lined up a lot of appointments ahead of time. Now, I think my secretary Bea Bilton probably made a whole bunch of appointments. That is, we tried to focus it so we could make a whole bunch of appointments at once.

Hanle: Yes, and in your files, you have lists of congressional staff members, which I guess you must have got

copies of in advance of these trips to set up appointments with the various staffers.

Bahcall: Yes, and I called as many as possible, and Lyman called some of them, and we used whoever we knew that would have some contacts with them. In some cases Lyman would make use of a Princetonian connection to get us an interview with somebody.

Hanle: Did you ever enlist in this first campaign the assistance of the president or provost of the university or any others in Princeton?

Bahcall: If we had thought it was relevant we would have; whether or not there were particular instances where it was useful I don't remember. But we often did later. We would just evoke the name of Old Nassau or whatever, wherever we thought it would do us any good. Now, that's the sort of thing which Lyman did. I had no handle on that. So if anybody had a Princeton connection, Lyman would wave the Princeton flag and get us in on that basis.

Hanle: And you could take advantage of the confusion of the Institute with the University, I suppose.

Bahcall: I was perfectly happy to do that if there was any advantage in that.

Hanle: Was there any role at all for the contractor?

Bahcall: I should have corrected a misimpression which must have been given because of my extensive answer when I confused the two campaigns, I think in the July campaign of that year, Lyman and I were the focal points and there probably wasn't much effort outside of our effort. It was because of that that I was called in this December of the following year. But I think in that time, there just wasn't time for anybody else to respond very much.

Hanle: What was the general response to your going to Congressmen and Senator's offices? Were you generally favorably received? Were there places where you were not well received?

Bahcall: We were generally favorably received. First of all, we were regarded most often as curiosities, because it was rare in those days, if not unprecedented, that a scientist appeared in Washington for a lobbying purpose. Most of the offices, Congressional or Senatorial offices that we visited, had never been visited by a scientist. It isn't true that the staff would line up to stare at us to see what a scientist looked like, but there was some flavor of that. So it was remarkably easy for us to get in because we were a curiosity.

Hanle: Did Professor Spitzer wear his sandals?

Bahcall: Oh no. Lyman was the very epitome of a senior Princetonian professor. He looked it; he is it; he was the personification of distinction. And that helped.

Hanle: What offices were you received warmly -- or were told this is not something to be supported by this office?

Bahcall: Well, we were rarely told that. After all, you know, those people are trained, and you have to have a commitment or interest in the program before you're willing to say that much about your Congressional boss, so there were a couple of occasions on which that was said, but if we only got to see a sort of general staff member who was not the senior staff member or had no particular opportunity to argue our case, no particular interest in arguing our case, then we would regard that as an unsuccessful and lukewarm reception. And that was in states where there wasn't much science interest or much science activity, or where there weren't great universities that were involved in this program. But every place that we could where there were great universities involved or great astronomical science going on, we had those people called individually, and warm up the offices that we were going to by saying that the University of Nevada is planning to make major use of the Space Telescope. Please help us to get our role in forefront science by getting our share of the Space Telescope. So people all over the country did that, and that made it possible for us to go into those offices with somebody, a few people there having had phone calls and a number of letters having come from that state saying, "Support this, it's good for our state." And that didn't often happen for science.

Hanle: Did you speak to any actual Senators or Congressmen while you were there?

Bahcall: Oh yes.

Hanle: Do you remember who?

Bahcall: It would be impossible for me to tell you who I spoke to in '74 and who I spoke to in '75 and I would forget some names. I'm sure if you've seen the memoranda of the visits that we had with various Congressmen, there were some which were memorable and some which were not very memorable. I remember writing very detailed memoranda about, for example, the Congressman whose district was close to Huntsville, adjacent. You've seen that?

Hanle: These appear in the later files. They're not in the '73, '74, to my knowledge.

Bahcall: It may be that those are in my correspondence files, either downstairs or upstairs. I would be surprised if I didn't report on those details some place.

Hanle: I'm glad to hear this, because it appeared to me that the file was fairly thin.

Bahcall: My expectation is that that's a reflection of a change in the way, a change in secretaries or a change in the way I was doing filing.

Hanle: OK. Let me go on to a couple of other quick questions. In the '74 period or for that matter in '76 and '77, trying to get the final approval for LST, did contractors play any role?

Bahcall: Oh yes, a very strong role. Not so much in the '74 activity, because that was hastily assembled. And if you see those memoranda from the later --

Hanle: Any at all in '74, even though it was hastily assembled?

Bahcall: I seem to remember Lockheed supplying me with information.

Hanle: At your request?

Bahcall: No, that was I believe a request that Bob O'Dell made a contact between me and Lockheed people, and suggested to those -- it may have been Lockheed, it may have been Perkin-Elmer -- who were interested in lobbying and had information. And that was very important at a later stage. Those guys really had good stuff on everybody, which was very useful.

Hanle: You mean background information about how Senators and staff members can be persuaded?

Bahcall: Or approached, or what were the most interesting avenues from their point of view on this project. And it was much easier. For them it was much easier to get us in the door than to get them in the door, certainly to talk to Senators and Congressmen.

Hanle: So they were happy to see you doing this, I'm sure.

Bahcall: Oh, they came to visit us here, came to visit. I remember Lyman and I met on several occasions in this office with contractual people on the later campaigns, and they were just enormously well informed, and they were using us in the same way we were using them. We had an identical short term interest, which was getting Space Telescope approved.

Hanle; Any from Perkin-Elmer, can you name the companies?
I'm sure that wouldn't be a problem.

Bahcall: No, I'm sure it isn't a problem, but I don't remember. I remember very clearly Lockheed. I remember Perkin-Elmer less, but there were some Perkin-Elmer people who helped. I can't remember other companies, but there may have been.

Hanle: Do any of the names, Jack Rehnberg, Dan McCarthy, ring a bell?

Bahcall: Dan McCarthy I knew from early stages in the Space Telescope project, but I don't think Dan McCarthy played a role in supplying information. The crucial thing for us was information, how do we get to talk to people, who are the people that are in the offices, what are their interests, how do we get into the offices, how do we approach them, what are the things that are going to sell to this Congressman or this Senator? The best information we had on that was from professional lobbyists for these companies. They were really good. There was a fellow named Mack something who was really a professional.

Hanle: From Perkin-Elmer?

Bahcall: No.

Hanle: From Lockheed?

Bahcall: I think so, but again it should be in some of the memoranda.

Hanle: That's a particular interest.

Bahcall: They would often call us, call me, from Washington, when they'd learned something new, or they knew something. I can remember Tip O'Neill and Eddie Boland were roommates together, and one or the other of them is going to be this weekend in Massachusetts, and maybe you want to get your friend at Harvard to invite him up to Harvard, or maybe you don't because maybe he doesn't like Harvard -- that sort of information. Boland at the time was a bachelor. Those guys knew all of that stuff -- if a Senator was interested in racing cars or whatever and spent his weekend on that. All that information that these guys had was information that we would not normally have, and some of it was useful.

Hanle: I'm tempted to ask for an example of how that might be useful. I suppose I'll have to think about that.

Bahcall: You asked about George Wallerstein. Boland had in his district a television station which was supportive of him, and at which there was a man who was well connected to

him. Now, it turned out that that man was on the board of trustees of Lowell Observatory, at least his brother was, and either he or his brother was, and George Wallerstein had also either been on the Lowell Observatory board of trustees or knew about that or something, or maybe he'd met this guy skiing, socially. Anyway, he knew the guy socially. So George Wallerstein was the conduit to the TV man who was in Boland's district and therefore this TV man could be induced to call Boland's office. That was the kind of information which -- this particular one didn't come from an industrial source, but --

Hanle: -- That sort of thing might have.

Bahcall: That's right.

Hanle: Now that you've raised Wallerstein -- how did it happen that you and Spitzer and George Field and Wallerstein were the four principal people involved in this lobbying campaign?

Bahcall: Just accidental, I'm sure.

Hanle: Did Wallerstein and Field have some special reason to do this also?

Bahcall: Well, Wallerstein was contacted. I knew George. I think I was probably the person to contact George. Maybe he'd remember better than I think I contacted him because I knew and liked him, and I contacted him as I did many others in different stated, and George just simply ran with the ball. So it was a matter of responding strongly and effectively, and there was so much to be done, anybody who wanted to do anything did it. And George did a lot of things.

Now, George Field was involved because George was on the working group with us. Of course George was a great man with a lot of scientific vision, and wanted to help good causes, as he always did, and he was well placed as director of a prestigious institution.

Hanle: I had something I was going to ask about Field. Did you perceive at that time that there might be some people who had very specific interests in getting Space Telescope up, in their own interests? For example, might the director of the Center for Astrophysics in Cambridge stand to gain a great deal by having Space Telescope put up?

Bahcall: Yes. We generally found, and I think I learned this from Lyman -- I was his student in many ways, Lyman's attitude I believe toward most questions was to look for the interest of the individual concerned. You might call it cynical, but it was usually accurate. You could predict people on the basis of what their interest was, very often.

Sometimes, of course their clear interest was to get the most science for the available dollars. So we often made use of that because Space Telescope was good for almost everybody, and when it was appropriate to argue that it was good for industry in this state, we found out what industry it was and we argued that. When it was appropriate to argue that it was appropriate to argue that it was good for science in a state, with the scientists, we did that.

Now, I don't think that anybody's position was compromised by that, because people recognized that. Certainly in the arena in which we were operating, the basic assumption was that you're doing it because it's good for you. Politicians would ask: why is it good for my constituents? Why should I support this?

Hanle: I meant, even as far as the astronomers were concerned.

Bahcall: Well, there were some astronomers who, I am sure, had reservations about our activity, and expressed them to us, because they felt that money spent on Spce Telescope was money not spent on ground-based astronomy. Money spent for big projects was money that would not go for small projects.

Hanle: Would you characterize Jesse Greenstein's position? Or did you just?

Bahcall: No, I don't think so. Jesse understood the difference, that the money comes from different sources, and Jesse was an early and effective spokesman for Space Telescope in the Greenstein Committee Report.

Hanle: I've heard different interpretations of that. Indeed, if you look at the record, there seem to be different opinions. Eddie Boland was able to extract from the Greenstein Committee Report something that he interpreted publicly as a statement against Space Telescope.

Bahcall: Yes.

Hanle: Do you think that was simply a cynical turn of phrase on his part?

Bahcall: Well, I think there was a feeling among most astronomers or among many astronomers at that time that the primary concern of astronomy was ground-based astronomy. I think the Greenstein Committee reflected that. I think, on the other hand, the Greenstein Committee was remarkably foresightful and set astronomy ahead by ten years by finding really important missions, and one of them which it regarded for the late seventies or whatever, was the Space Telescope. It was outside their individual --

Hanle: Eighties, I think they said.

Bahcall: Or it was the eighties. It was a correct perception on their part, but it was interpreted as being lukewarm. I think there probably was a lot of lukewarmness among astronomers at that time. I think Space Telescope was not high in the consciousness of astronomers. A majority of astronomers favored it when pushed or pressed, but most of them hadn't thought much about it, and at the time that the Greenstein Committee Report was made, we were less sophisticated as a scientific group about how financial decisions were made in Washington.

Hanle: I wondered if Greenstein himself or any others on the committee were in effect opposed to putting resources into the Space Telescope that might come at the cost of ground-based at that time? '72, whenever it was?

Bahcall: I think they would have been opposed to making appearances before Congress that implied that Space Telescope had priorities above other major ground-based facilities, at least that they hadn't settled in their committee. I don't know what Jesse's opinion was at that time, and I suspect that unless you have access to specific correspondence, it would be difficult to establish.

Hanle: There's one letter in the file in which he takes exception to a statement you and Spitzer made to Congressman Talcott to the effect that now that we have the four principal recommendations of the Greenstein Committee, we can go ahead to the second tier of priorities. And the top priority is Space Telescope. He objected that those first four priorities hadn't been met, first four recommendations, and I wondered if behind that objection lay some general concern that money was being siphoned off from ground-based to space-based. In your view.

Bahcall: I don't know what was in Jesse's mind at that time, but I think what is certain is that that was the position of many prominent astronomers at the time. I don't know what Jesse thought, but I think there was not the distinction made between NASA support of astronomy and other support of astronomy that is now apparent to us.

Hanle: There was not that distinction among the astronomers.

Bahcall: Many prominent astronomers didn't realize that that was an effectual important distinction. That is, the budget of NASA was established in different ways than NSF, and independent largely of the budget for the NSF and for the other agencies that were supporting astronomy, like the ONR for example.

Hanle: That's an interesting point, and it's clear now that that's true. I wonder if, back in 1974 even, there might not

have been some sense in which it was a common kitty for astronomy. Even within NASA and NSF. Or on Capitol Hill.

Bahcall: I think it's more likely in the minds of the Senators and Representatives, not in the budgetary minds. I think that the things that drive people who establish budgets within their agencies are to do the best they can within their agency, given the fact that they have to support a certain number of people, or the agency collapses, and they have to have a certain amount of prestige, and they have to make a certain number of people happy, and they want to do the best things they can do for science and technology and the mission of the agency. But that's within their own agency. They don't look I think so much at the national picture.

On the other hand, the Congressmen and Senators, if they hear NASA advocating a telescope and NSF advocating a telescope, even if one is radio and one is X-ray, they tend to say, "Didn't we just give something for a telescope?"

So in that sense, I think there was validity to the --

Hanle: I think (George) Shipley even said that to you, didn't he?

Bahcall: Yes, I'm sure he did. Is he the man who came out of the House of Representatives and said, "Didn't we give you boys a telescope last week?" or something -- which was the VLA and not Space Telescope. Spencer mentions that.

Hanle: OMB is the office we haven't talked about, and that does have more of a national picture.

Bahcall: That's right.

Hanle: In fact I believe the chief of the science side of things was Hugh Loweth, and I think Loweth then as now looks at science overall. There are people above him too in the science role. The point is, might they have viewed astronomy as a common kitty then, and might they still view it as being funded out of a common kitty now?

Bahcall: I'm not an expert on OMB, but I think that individual agencies' and departments' interests are so strong that it's very hard to have that national point of view. It's not easy, although I enormously respect anybody who can achieve it, but I think the problems which Space Telescope had in funding were rarely if ever at the OMB level. They were at the level of the highest NASA administration, and with some individuals in Congress. I think OMB recognized the national, even international, importance of the project, perhaps before some NASA people did.

Hanle: Have you been able to identify any opponents of ST in NASA, I mean active opponents? Or LST at the time?

Bahcall: Not who wanted to be counted as against it.

Hanle: Maybe the Office of Manned Space Flight, one way or another.

Bahcall: What they said in their private councils I don't know. I was given enough inside information about what was happening at NASA that if some group were very actively lobbying against it, I think it would have been within our power to affect the actions of that group by having their constituency say that they supported this or that. Then I probably would have been told that. If there was nothing I could do about it, I probably wouldn't have been told that.

Hanle: In that regard, I note you wrote and said in '74 as part of the campaign, to Rocco Petrone, and in fact you carboned him on a couple of other of your letters. He of course was head of the Manned Space Flight Office. I wondered why that was. Do you remember?

Bahcall: No.

Hanle: I think that would be interesting to know, since that's the most -- well, it's possible that Space Telescope was still being considered as part of Manned Space Flight, also, that late.

Bahcall: I don't know. It may be that Lyman knows more about Petrone than I do. Petrone was not a source which I believe I had any contact with much.

Hanle: Might it have been that one of your advisors within NASA suggested that you carbon him?

Bahcall: Yes. Or for all I know, Lyman or I called him and talked to him and so forth. You know, if there were any use in us talking to him, we would have been told by somebody in NASA "Call him, talk to him," and we probably did. But I don't remember.

Hanle: Now that we're in the middle of this campaign, I'd like to get a few more impressions. One of them was, you remarked in your "Summary of Considerations" that there was general surprise at the consensus that was built by astronomers in favor of Space Telescope, and you mentioned to me earlier that it was awfully difficult to get that consensus, at least as far as the Greenstein Committee.

Bahcall: Well, I wouldn't say it was awfully difficult. I had to talk to some fraction of 23 people. I don't remember how many Lyman called and how many I called, but I think it was primarily my responsibility. There must have been some people on that list that we thought that Lyman would talk to

more effectively than I did, but you can imagine the number of interactions, if you have 23 people, to get something which is acceptable to all of them, on a very short time scale.

Hanle: What was the time scale, a day or two?

Bahcall: It was a few days, I think.

Hanle: Why was the time scale so short?

Bahcall: Because things were happening in July with regard to the budget, whether it would be restored or not, and we had a specific request to respond to what the Greenstein Committee really meant, because as you correctly recall, the Greenstein Committee Report was effectively used against the Space Telescope. It wasn't the position of the Greenstein Committee, but it was effectively used against it.

Hanle: I believe you were able to not only get that unanimous statement that LST had top priority, but also Greenstein himself testified later, and wrote a letter in any event, in favor of Space Telescope.

Bahcall: Yes. That's certainly right.

Hanle: Which suggests a strong basis of support. I found that slightly curious, if not contradictory, with his somewhat angered letter, slightly heated letter, to you and Spitzer regarding misstating of ground-based successes.

Bahcall: As I remember, it was somewhat Talmudic, this statement that we drafted, in that we had to be clear that it was top priority among a set of options which did not include any of the options that any of the members of the Greenstein Committee were personally strongly involved in. So while it sounded very powerful, I think if you read it very carefully, it was less powerful than it really sounded. I don't remember the precise wording of it.

Hanle: It's as if you were asking everybody to vote the first and second priority and then to add up the points, and the second priorities for everybody come out higher in total than the first priority of any because each of the first is

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Bahcall: Well, we defined it to be top priority among, I don't know, space projects, or whatever it was that we could get through.

You see, that was one crucial element where Lyman and I were quite complementary, because there were people there that Lyman had a much warmer and longer relationship with than I did, and vice versa. Part of that was age and generation, and part was just that. And we would quite

callously divide up the list according to who we thought we would most easily be able to persuade.

Hanle: Is there anybody in particular who stands out right now in your memory, somebody who was difficult to persuade, or easy, an ally, somebody notable, or?

Bahcall: If I looked at the list of who they were, I might remember. I think everybody was concerned that we not cut other projects out while we advocated Space Telescope. That was a really tough thing.

Hanle: Greenstein was concerned about that too, and in his letter to you and Spitzer of August 16, in which he expressed alarm and dismay, I believe is the phrase here, anyway he was concerned that he would have to set the matter straight with Congressman Talcott. To your knowledge did he ever do that?

Bahcall: Oh no. No, no.

Hanle: Spitzer's response in effect said, "Well, you might go ahead and do that, because it would be the best way to handle this if you seriously think it's a problem, but why is it such a problem?" And then he went on to point out some counter-arguments.

Bahcall: Yes.

Hanle: Is there anything wrong with that?

Bahcall: No. Lyman is a master at that -- of listening to everybody and doing in the end what he wants to do.

Hanle: It occurred to me, that summer, in fact that very week of July 25 through about August 9 when the decisions were being made, was the week that Richard Nixon resigned the Presidency. Did that factor enter at all into your lobbying? How much of official Washington was preoccupied with Nixon?

Bahcall: Well, we were there during the time of those considerations and those preliminary hearings, and that sometimes made it difficult for us to get into rooms, because there were so many television people around. I remember on one occasion, I'm not sure if Lyman had his sandals on or not, but we had an appointment with somebody, a Representative in one of the Congressional office buildings, where there were many many cameras and television people outside, and there were lots of police, but we had a specific appointment.

Well, we couldn't get through and nobody else could get through. All these television people. It was a big crowd.

I remember that in the end, what we decided to do, there were some television cables across a corridor, where there were lots of guards and other people, but there were all

these reporters, and in particular photographers with these big cameras.

And Lyman and I -- we were desperate. We had an appointment. We thought it was an important appointment. It was a legitimate appointment, but we were not getting through.

So we decided that we would just walk across the cables, like we knew what we were doing, and just keep going. We figured that, you know, we looked like we were -- you know, we had suits and ties on, and we looked like we were respectable people, and we had just small briefcases, so we weren't camera men, and we figured that they wouldn't shoot us, but we joked about whether they would shoot us or not -- and we stepped across the cable, and nobody even said "boo" to us. Nobody said "Where are you going?" or anything. We just looked like we knew what we were doing, and we just walked on down the corridor, and nobody said anything to us!

Hanle: I wonder if that helped access for you. After all everybody else was barred.

Bahcall: I don't know. I think that was only a short appointment that we had. I think it was with a Congressman from California at that time.

Hanle: But it's probably fair to say that was a minor perturbation on your operation. I wanted to go to Bob O'Dell as an insider. It's clear in the files here, it comes through later too, but I'm focusing on this period, his allegiance is to astronomy. He is an astronomer.

Bahcall: Precisely.

Hanle: That, of course, from my point of view as a member of an organization, I see that as something which could pose him serious problems.

Bahcall: It did.

Hanle: I wonder, did he run into conflict with the project manager and others at Marshall? Or was it perhaps -- ?

Bahcall: Well, Bob, as perceived from the outside, was a team player. Now, I believe I knew Bob better than anybody else on the working group, I would say. I believe, I don't know what his files show, but I suspect that on the outside, I was the person that Bob was the most frank with and the most open with about what was happening. I suspect that he told me things, that are not in his files, but may be reflected in his files compared to what he told other people, that he didn't tell other people, and I don't think any problems that he had with the...I think Bob did have problems at Marshall, but I don't think they were because of his scientific allegiance. I think they were in largest part

because of his style.

Hanle: Could you characterize that style? How it might pose problems?

Bahcall: It's a little rough at times, not as smooth as...It's a style which causes you no problem at all in science, where if you call somebody a fool, it's a way of getting his attention, so that he will listen to what you're saying, and then you can decide who's being foolish at this moment, and being a fool at one time is no disadvantage in the next discussion.

END OF TAPE