

ROBERT BALLARD PH.D.

ORAL HISTORY

COMPUTERWORLD HONORS PROGRAM
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Transcript of a Video History Interview with
Robert Ballard, Ph.D.
The Jason Project

Recipient of the 1990 Computerworld Honors 21st Century
Achievement Award in Education & Academia

Interviewer: Jon Eklund (JE)
Division of Computers, Information, & Society
National Museum of American History, Smithsonian Institution

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JE: Today is April 7, 1993. I'm Jon Eklund from the National Museum of American History. I'm interviewing Dr. Robert Ballard, one of the winners of the Computerworld Smithsonian Awards. To get things started maybe you could make a semi-formal statement about who you are and what your role is in this project.

RB: I'm Bob Ballard and I'm a senior scientist in the Applied Ocean Physics Department at the Woods Hole Oceanographic Institution. Five years ago I began program called the Jason Project for young people to excite them into pursuing careers or at least schooling in science and technology. Can you tell us something about how you first got the idea to do this?

RB: I've been at Woods Hole for twenty-seven years now. We have a program in Education with MIT but it's with graduate students. We see the final crop and its very frustrating to watch that crop of very bright graduate students become less and less American. Its sort of an honor that the world seeks an education in our system, its also sad that our kids are less and less competitive in our own system. For years there wasn't much I could do about it other than just being frustrated by it like everyone else. But then sort of a funny thing happened on the way to the forum.

I'm an exploration scientist. My backgrounds in earth sciences and I've spent my career in deep-sea exploration. For most of it, I've spent it in a submarine, deep diving submersible. One of the frustrations of deep-sea exploration is that a submarine takes you to the bottom of the ocean and has to bring you home at night and the average depth of the ocean is twelve thousand feet. A typical dive is two and a half hours to get down, three hours on the bottom and two and a half hours to get back. You're spending most of your time commuting to work and spending very little of it working. In fact an average dive would cover maybe a mile. When you consider that the earth is 71% under water, it's going to take a lot of one-mile dives to map it. That's why we have better maps of Venus than of Earth. We have better maps of the backside of the moon. It has never faced the planet.

Several years ago I began developing the new exploration technology that I call "Telepresence" and the idea was could you create a submarine that didn't have your physical body in it but had your spirit in it. Could you use fiber optics and have tremendous bandwidth of information so you could have a simulator. The initial idea was to have the simulator up on the surface and go into a room and all of a sudden you were on the bottom of the ocean because the room was connected via fiber optics to a robotics system that had cameras and lights and all of that. Because really when you go down in a submarine you don't get out. Neil Armstrong can walk on the moon but you don't walk on the bottom of the ocean. So you're really not down there. You're looking out of a window. The question was could you move the window. That's what we did, we used the new developments in fiber optics to simulate a window and then operate manipulators and at that point it was a submarine.

JE: Was this a fiber optic link all the way to the bottom of the ocean?

RB: Yes it was all the way from our cameras...its quite an interesting feat when you consider that the cables going around and around and you have to take the fiber which is the size of a human hair and align it to the axis of rotation of the winch so you can fire a laser across it because you can't have a physical link or the wire would twist. It takes quite an alignment. The idea was that I could then go into this room and the robot could operate twenty-four hours a day and my rate of exploration would increase exponentially. Also the number of people that could be involved could be greatly increased. My ultimate goal was to do it from my home on Cape Cod by way of a satellite link. So in 1980, I presented this concept to the Navy. I had to present it for two years before they realized I was serious and then they funded it from 1982 to...I just finished it a few months ago.

But during the course of this journey I was testing this new technology. In 1985 we finished the first robot, the search robot, we called Argo. It was the ship that carried Jason in his search for the Golden Fleece. I said, "Let's go out and test Argo and put it down and leave it down. Just show its power." And naturally one wanted a challenge, to demonstrate, to make a point. One of the Mount Everest's in my world that had not been scaled had been finding had been finding the Titanic, which fortuitously was right off my coast in deep water nearby. It was a good place to go. I went out and searched for it and found it.

It was interesting in that it shaped my life in many ways. One particular way was all the children that wrote me letters. Here was a ship that had sunk three-quarters of a century before and yet I was receiving thousands and thousands of letters from young people.

JE: Was this the result of some of the programs...?

RB: Seeing the Titanic Expedition on National Geographic. They saw it and were mesmerized by this scientific adventure. We had a little robot called "JJ", very much like R2D2 and CP3O. George Lucas and Steve Spielberg set these kids up for it. But they always gave them fiction and now all of a sudden here was non-fiction. Very modern day high-tech exploration of their generation. The kids from Nintendo, from television saw this and said, "That's what I want to do." They reached out by writing me letters. All of these letters came in and it was a rather impressive number of letters. They all said, "I want to do what you do. How can I do what you do?" And the answer was "Go to college and take physics for ten years". And obviously they weren't making that connection between rigorous scientific and technical education and the fun I was having. They wanted to play but didn't know what was the price. And it turns out that they're willing to pay it.

My goal was to create a telepresence at home, why can't I create a telepresence for them? It doesn't really matter how many people are in the room or how many rooms there are once you decouple your physical body from your spirit, anyone can play. So I said, "Let's do an experiment. Let's go out and convince a series of organizations. The first year it was about ten organizations, museums and universities and others to build one of these rooms to build similar to mine at sea and to invite young people into the room. But only if they would take a science class in school and only if they would study a fairly comprehensive curriculum. Well 250,000 kids signed up in the first year. And just a few weeks ago I did it for the fourth time and this time 700,000 kids signed up and they went into these rooms and I took them somewhere in the world and then we went exploring and they keep coming back. I've touched a nerve.

JE: I think its word of mouth actually.

RB: World of mouth amongst teachers, mostly amongst teachers, saying, "these kids come into these rooms and they're quiet." To give you an example, we have one here in Washington D.C., Grosvenor Auditorium. The first year we did the Jason Project, 5,000 students participated from the Washington, D.C. area. The next year, 8,000 students, the following year 12,000, this year 22,000 but 40,000 signed up.

JE: Was the first year 89?

RB: '89 in the Mediterranean. We went over and I said, "Let's go look for a Roman Ship." I had done some homework and archaeologists said that Rome had lost 10,000 ships in the Mediterranean. And I said, "Well, I should be able to find one of them". So I took a ruler out and I drew a line between Carthage and Rome and I said "Drive on that line" and sure enough I found a ship fairly deep. I guess it's one of the deepest archaeological sites ever found, its 3,000 feet of water right along the trade route between Carthage and Rome from the 4th Century. We came down on the galley; the table was still set almost. Everything was lined up in rows and plates and cups, grinding stone, little lamps. We worked with a team of archaeologists, we excavated the ship live. The kids were looking right over our shoulders. They participated in it.

JE: So that Argo can bring stuff up?

RB: Oh yes, if it wants, manipulators and elevators. We used elevators actually. Take an elevator down, fill the elevator and drop a weight and send it to the surface and re-unload it and put another weight on it and send it back down. It was quite a conveyor belt. It worked well. Didn't scratch anything. Didn't break anything. Archaeologists were impressed because the manipulators could be very compliant. You could crank them so they couldn't bust an egg; just like a rheostat. They could crush something if you wanted them to.

JE: You had the idea.

RB: Then you have to make it happen.

JE: Exactly so and at some point there's a lot of telecommunication to set-up.

RB: You put together a team. To me its very much like...life is an epic journey and an epic journey you begin with a dream or concept, something crystallizes in your mind and then you have to prepare for it. You have to go and assemble your argonauts to do it. And you have to go forth on the journey and overcome the Cyclops or the sirens calling you onto the rocks. Every expedition I've ever gone on the sirens have called me and I tie myself to the mast and I don't listen. You're always tested and then you attain a truth. That's what scientific inquiry is, attaining truths and then you come back and share that truth with society at large. That releases you and you can go on another journey and I think that that's what exploration is all about and what life is all about and I think that when you do that young people tune in on it. There's a natural frequency to it.

JE: It's a lovely metaphor. In your particular case, for the Jason program, you put together a team.

RB: I was lucky I guess for some reason to be a generalist. When I went to school I didn't major in any particular science. I took a five-year major in physical science. I had to take physics, and math, chemistry and geology. I went to the University of California at Santa Barbara so I had to take everything else. I've always been a generalist and that makes it possible to talk with a lot of different people from different worlds and not frighten them. I served in the military. I still am a commander in the Navy. I have my own company, boards, stockholders and stuff like that.

JE: So you're used to assembling projects?

RB: I'm used to networking dissimilar people. I think everything is done on the edge of society. All the exciting things occur on the edge and at the experimental edge and when they're successful society sort of pulls them into the center. Generally the edge of anything is where you're pushing the envelope. I think whenever you take dissimilar organizations that have tremendous talent and blend them you're doing something different; you're on the edge. So I was able to take very dissimilar groups of people.

JE: How would you describe these groups?

RB: Well National Geographic, Turner Broadcasting, EDS Corporation, the United States Navy and academia, museums, universities all committed to education from nine different angles, but committed to a common denominator and that was "We want to turn young people on". Each organization had a unique skill set that when blended became awesome. That's what I mean by dissimilar, groups that wouldn't normally have much to do with one another. I mean you don't think of academia and military in the same breath. You don't think of academia and corporate America in the same breath. You certainly don't think of the military and the media in the same breath. But yet we're able to take that group of people and make them a coherent team that is still together. No one has left. We're in our fifth year and we only see one another once a year to come together to do this.

The group for example from television that does this normally does Saturday morning wrestling. It's one of the few live things that are on television. We are taking science and making it a sport. We fill the Superbowl nine times in March with young people. Imagine the Superbowl just in your eyes - nine times we filled it and emptied it over a two-week period of time with young people to watch a scientific sporting event. To create positive role models. Boy, Larry Bird screwed up, he's out at 35, I'm 51 and I'm still in the game. He picked the wrong sport is the message to the young people. Pick the right sport and you can play it for life.

JE: Since we're talking about young people, your customers if you will, what does the customer see in the program?

RB: It's interactive.

JE: But I mean where does she or he hear about it? From their teachers?

RB: They hear about it from their teachers or they just hear about it. Generally you begin by establishing a site. That can be anywhere in Washington, DC, or in Dallas, Texas or in Liverpool, England or Bermuda or in Toronto or in Mexico City. We're not just a U.S. thing. We establish a downlink site. It's a physical site. Generally it's an auditorium. We go in and convert it into a telecommunications center, sort of like a NASA control center, screens and equipment and people in jumpsuits with baseball caps and patches.

JE: That would include the Superbowl?

RB: Yes. We wouldn't be in the Superbowl, it's an auditorium, but we have 30 of them. And we're filling them and emptying them every hour and a half. It's a scientific Superbowl. And then we design a pretty complicated expedition. And then we make it interactive. All the sites have common communication links so they can talk to one another. A kid can ask me a question and I can have it answered somewhere else.

We actually have workstations where a student can come up and we'll give him the robot through the satellite system, yours to drive it. Particularly if they've had any Nintendo experience they just, off they go and the students watch them. We've had students and teachers go on the expedition. It's very interactive.

JE: The customers, the students they're on site, see all this.

RB: Yeah, everything. It's multimedia. They're watching a student in Denver from Liverpool, England drive a vehicle in the Sea of Cortez, all right in front of them. Someone will ask me a question from Sarasota, Florida and I'll have it answered in Toronto all in real time. Live means a lot to young people. It's why people go to auto races, watch for the crash. They're waiting for us to trip and they applaud us when we don't. They know we're taking a risk. Young people know what risk taking's all about and then they stop doing it later on. All kids are pretty good risk takers up front and then they stop taking risks and we're showing them that risk taking is what its all about.

JE: The first program was...

RB: The Mediterranean. The second program was two war ships from the War of 1812 in Lake Ontario, the third program was in the Galapagos Islands, and the fourth program we just did in the Sea of Cortez and next year we're going to follow a raindrop in the rain forests of Belize. We're going to start with a raindrop in space and follow it down through the canopy and find people in the canopy live working, drop to the floor, see the creatures of the floor. Follow the river systems, go into the limestone formations, into the subterranean, into caves, come back out and go into the Barrier Reef and walk them through it all live with the scientists working at each place along the way.

JE: So essentially it will be a series of...

RB: Of live stations with virtual reality in-between. We'll go from live to virtual reality back to reality. Virtual reality is really wonderful for showing you where you are and getting you around. It can't beat reality once you arrive but its wonderful in virtual reality not to have your body...just flies through space. You don't have to look out of a window. You're a bird and you can go very fast and you can go anywhere. You can start in space, looking down at the earth and fly down and enter the rain forest and then be there live and then move from there through some other system and then constantly moving between the two. Electronic travel is what it is.

JE: Right. The rain forest one sounds though as if it the most imaginatively complex.

RB: We crank it up each year.

JE: At some point after the last program you all get together. The team gets together and meets for new ideas.

RB: We just had a team in Belize, tromping through the jungles, finding where we would put the tree house. Where does the robot drive? Where do the drivers dive? How do we get through the canopy? We've got people then going down with all the microwave system. Can I hook this all up? These guys have got this crazy idea but can I translate it to reality? The TV producers have got to then produce it.

JE: You've mixed deep sea with terrain stuff in the latest thing.

RB: We did it in the Galapagos and in the Sea of Cortez. We had a site over in Wales and in the St. Ignatius Lagoon. The ocean is 71% of the planet. You tend to bump into it. It's largely unexplored. So it's a place you tend to find yourself in for exploration. After Belize we're going to do Mars with NASA --the whole preparations going to Mars---going over all the places the astronauts are preparing to go from the space shuttle live.

JE: The 71% figure and the unexplored nature of the ocean is kind of a natural or key statistic. Do you get core ideas or does the team think in terms of core ideas they really want to get across to the customers?

RB: We're trying to put curriculum down in front of them. It's like a fishing net. We want it to be very broad. Its planet earth. That's pretty broad based. We're going to find archaeologists excavating Mayan ruins in this program. We're going to find a medical team treating today's Mayan Indians. We're going to find people in the canopy. They key is to build the bridges and link it. The idea is that every child has an interest in something. It could be wanting to be an archaeologist. It could be wanting to be a doctor. It could be wanting to be an astronaut. We're trying to create a curriculum that's so broad they're going to find an interest there.

JE: You have a central message of science as a voyage with interactive and interesting inquiry. The students are certainly going to be primed for exploratory types of science, natural history and so forth. That's a terrific thing.

RB: It's called building bridges or in the entertainment business it's called segue. What you want to do is to show a young person why they're taking all these broad based classes.

JE: It's not necessarily boring.

RB: Right--that it's a tool. Some classes are more tools than application of tools. An analogy I think of is that when I was playing college basketball, the coach at the end of practice, two and a half hours of practice would say "Give me 30 wind sprints up and down the court". That was the last thing I had in my mind, yet I did them. They were painful. Why did I do them? Because I knew that was the price I had to pay to play in the game. Math exercises are mental push-ups--mental wind sprints. I didn't enjoy doing math. I didn't say, "Oh, I can hardly wait to go home and do my math." Some people did but very small. I did it because I wanted to play in this game called science and exploration. I was sold on the game and I did what I had to do. So what we're trying to do is sell them on life, sell them on the acquisition of knowledge and get them hooked. To get them to say "I want to play". I've watched kids skate backwards for a thousand hours to learn how to cross over going backwards. I can't skate. I watch my son. Humans were not built to skate. The only way you're going to learn how to be a hockey player is to have an outrageous amount of ice time.

Well, that's the same thing. Can you sell them on something other than hockey? I look at science education as competitive with Michael Jordan. I'm competing with those people. I'm proactive. I'm not going to wait for them to come into the classroom. I'm a coach I'm going to go out and get them. I'm going to go out and sell them. I'm going to recruit them. I'm going to recruit the whole class. I'm not after the gifted kids. I'm after all of them. The Bell Curve to me is a natural function. I'm not going to try to think that we can somehow miraculously skew the Bell Curve. It is what it is. The key is to move the whole Bell Curve intact a great distance. I'm after all kids. Particularly after the kids that are about to quit because you know it costs \$30,000 a year to go to prison and its only \$24,000 to go to Harvard? 98% of the prison population of America is high school dropouts. We you have a kid drop out at the age of 14, 15 or 16, the price you're going to pay, the social price is unbelievable.

It's sort of like that ad on television, the guy's holding an oil filter and says "You can pay me now or you can pay me later" and they're pulling an engine. I don't think you can escape this. You must go out and proactively recruit kids to learn. I think that exploration is a wonderfully recruiting tool. Do I expect that all those kids to be come scientists? Not a chance. But do I expect them to stay inquisitive, to have a respect for problem solving, that you can solve problems and to respect the process of mental discipline to do that.

JE: You provide this interesting experience as a voyage of discovery.

RB: It's the carrot and the stick.

JE: What about other connections? Is there textual material associated with this?

RB: There's a curriculum in books. It's 250 pages that are distributed. Here's how we do it. We dream up where we're going to go. Okay, we're going to go to the rain forests of the planet and we're doing our fieldwork. We now begin our curriculum development. We bring together the National Science Teachers' Association. They're our read on that. We then say "Okay NSTA, we're going to have a meeting and we're going to bring in all the scientists that are cutting edge in the whole broad spectrum. We're going to bring in archaeologists, we're going to bring in scientists, we're going to bring in doctors, we're going to bring geologists, biologists, ecologists, the whole nine yards". Put them in a room. They're going to tell you why they're excited. What turns them on. Scientists are really doing science because they love it. It's fun. Can you translate that to me? Why are you excited? And let them rock and roll in front of these people. And then have the teachers say "Now how would I translate that to my seventh grader?" And to work with them.

I'm finding more and more commitment on the part of higher education people to the lower educational process. We're all getting in focus on the seventh grade now. We're building bridges that kids don't see early in their education. "Why am I taking this? It's nothing to do with what I'm interested in." The key is "Oh yes it does", everything is interconnected. We have to build these pathways. These intellectual pathways. You have to remember that a textbook takes about five to seven years to get into the hands of the student. Information doubling every eight years so this thing is hopelessly out of date the day it arrives. What we try to get cutting edge information to the teachers in the format that they can present it to students in a few months.

Starting next we'll start the development of the curriculum. We will work on that all through the summer, iterating back and forth between the scientists and teachers, lesson plans, examples, metaphors, analogies, you name it. Whatever it takes to build bridges. We go through this process up and until September. Then we print 15,000 copies of this curriculum. We then go into the field into each of the downlink sites and assemble all the teachers. Typically three to five hundred teachers per site who have signed up to bring their class. We train those teachers in workshops. Many of them have become pro's, they're in their fifth year. We walk them through the curriculum and then they go back to the classroom and prepare their students. They bring their students back to the downlink site at assigned times and we go on the expedition. We do it sixty times over a two-week period of time. We hand back to the teacher a very excited student.

JE: How do you do it sixty times?

RB: Every hour and a half. They've studied for months for this hour to walk into that room and sit down and follow a raindrop and we do it sixty times. Four time zones simultaneously.

JE: Let's start with the first one --the one with the ships.

RB: They've studied the Roman trade route. They've studied how we can understand about the history of that time through the amphorae that we collect and how the amphorae are different. We talk about the wind patterns that sank this ship. How did this ship get to the bottom? We talk about what happens when the ship arrives and how wood boring organisms attack it and eat it. We talk about the technology that found it, the robotics and fiber optics that are bringing the imagery to them. We talk about geosynchronous orbit satellites.

JE: This was all in the curriculum package.

RB: Right.

JE: So then the actual encounter hours. For that hour they're with you, they can interact?

RB: Right. We tell them through the course of the hour, we tell them all of the other material as we walk through for example, say the archaeologists want to recover that particular amphora. They've studied it, they've mapped it, they want to bring it to the surface. So in comes the robots, clicks over, grabs it and takes it up to the surface. So you take an hour work function and you factor it into the program. So it's sort of like coming into the control room and I say, "Hello, you're working. Here's what we're doing right now. A person over there will turn around and introduce you and go back to work. Here's what we're going to be doing with that. Are you ready? Let's go."

Or like we did this last trip we were down at hydrothermal depths. At 7,000 feet down, looking at creatures. You tell a kid that there's a worm on the ocean that's eight foot long and he wants to see it. It has a pint and a half of blood. It's just like humans with hemoglobin in it. You want to see it? We'll just a second I gotta tell you a little more about this worm. Well this worm is living off of not the sun. Its the only ecosystem on the planet that lives off of the chemical energy of the earth instead of photosynthesis its replicated that through chemosynthesis. You want to see this worm? I'll show it to you now. There's this worm and by the way there's several thousand of them and you want to see what happens when I touch it? I going to bring one up, cut it up and show it to you. You're kidding.

So the point is that it's a mixture of all the methods of communication. I believe in Walt Disney's axiom: To educate you have to entertain. You've got to compete. The whole concept of the caveman who sort of sat at the entrance of his cave, sort of with a glazed look on him. I don't think that they're dull witted at all. I think they're scared to death that someone is going to eat them. They were running around. They did anything but sit quietly dumbfounded.

They had all sorts of crazy things going around in their heads. People are busy. You walk out on the street here, everyone's preoccupied--with what--a myriad of things. So you have to compete with what they're preoccupied with. You literally have to wedge your way into their brain and talk to them. I think nothing is more fascinating than something visual. 65% of your brain process visual images. Don't talk to people, show them. Show them something they've never seen before. Get their attention.

I think in the pulse of educators there's a rhythm to it "I'm going to tell you something really, really interesting". Then I tell you something interesting and then I say "Whoop. Don't go away". There's a pattern in lecturing, a pattern in communicating of continually grabbing the person's attention. Sometimes you have to fire a cannonball across the room, smash down. What was that? Well, its ballistics. Let me tell you about physics. I believe in no holds barred to educating people. I'm doing a television series right now with Steven Spielberg, called "Seaquest", it will air on NBC in the fall. Underwater exploration. I did a spy novel called "Bright Shark". It's out now. It obeys the laws of physics. It's fun. No one gets killed and no one gets in bed with anyone. Sounds dull. I don't know. Sold 300,000 copies of it. The point is that education is a full court press and there's no holds barred. You can go over people every which way. I go after them any way I can.

JE: The teacher gets the curriculum. Does the teacher select...?

RB: A portion of the curriculum that fits their age group, fits their venue. Are they a chemistry teacher, a math teacher, a physics teacher? What is their class that these kids are enrolled into? Then they pick that portion of the curriculum that fits right on to their lesson plans and that's what they teach. They don't teach all of it.

JE: Does the student get written material as well or is primarily that the teacher will lecture?

RB: They do lessons and they do different projects. They build robots. They set-up chemosynthetic eco-systems, they make synchronoous orbit satellites go around the room. It all depends on what the teacher wants to hit. For example...

JE: So the curriculum includes projects?

RB: Oh yes, zillions and zillions of projects---lots of hands on. They learn about Jason. They learn about a million things and then they may seek to learn more afterwards.

JE: Have you thought about doing follow-up? Do you get spontaneous feedback primarily?

RB: You get them standing giving you an ovation. We do follow-up studies. Several of our downlink sites are educational institutions for example. Our downlink site at LeHigh University is at their School of Education.

JE: So then the teachers and students follow-up?

RB: I want to put probes into these students. And they have. They have done some interesting studies. They've taught us several things. They cannot tell whether it's a boy or a girl. This myth about science and technology being a white male sport is all wrong. A young woman is told she can play, she'll play. She can see that there's a pathway she'll play.

JE: I'm convinced of that myself.

RB: Students before they ever heard about Jason had a mental image that a scientist is social cripple that hides from society. They go in these places and they hide because they can't get along. They trip over things; they don't even know how to ride a bicycle. They certainly don't like the opposite sex. This whole nerd, geek image. A very bad image of the scientist. Give me a positive role model of a scientist, "Back to the Future", "Young Frankenstein", "The Crazy Scientist". These are not positive role models. They go through our program and they go "Wait a minute these people are hurdling buildings in a single bound". These people have the right stuff. The teamwork, the broad based intellect, the energy level, etc. They walk away saying "That's a scientist? I'm interested."

JE: What were the major obstacles?

RB: Money, pure and simple. Not getting teachers. Not getting students. Not putting on a good program. Very few people give to alumni class in the ninth grade. Harvard yes. Everyone assumes that pre-college is handled by tax and to get someone to invest in pre-college education is discouraging, demoralizing, depressing, particularly when its so cost effective. The cost of a child to participate in the Jason Project is less than the cost for the same child to go look at Lethal Weapon III. And they don't study for that. It costs five dollars per student and to raise that five dollars. I used to raise more money in the Pentagon in an hour. It took me a year for the Jason Project.

JE: What are the primary sources of funding for Jason?

RB: Private. We're not educators. We're not in the establishments. We're research scientists. We're experimental scientists. What do you know about education? I don't know but I just got these kids levitating. I don't know how I did it?

JE: What does anyone else know about education? I'm with Jacques Barzon. There's no education just teachers and...

RB: We're not sort of an insider group. You know what that means. You better find your money somewhere else. Most of the industry, EDS Corporation, a major sponsor. Why? They say "There's no one in the system. We're totally dependent upon technically literate kids and we have to retrain them and it's costing us a fortune to recruit and retrain. Gosh if you guys can have an impact for five bucks, here's my five dollars. "

JE: When and how did you really know that the Jason Project was successful?

RB: From the teachers. When they say, "I can't believe it." They walk in that room and they didn't make a sound except "Oooh, Ahhh" and applause. The teacher s say "I'll be back".

JE: And they're coming back. The numbers keep increasing as you say. Is there anything that you've heard about that is at all similar or is this pretty much it?

RB: I hear of more talk, the first rumblings of some action. I think it'll become more when you see the power it has. So many educators curse the dark and that's called the television set. They say, "Never will I ever use that". But that's a powerful media. It's the technology of today's generation. It's extremely powerful. We must master it. Very few teachers have ever mastered the technology. Particularly since 85% of all pre-college science teachers are illiterate in physics, math and chemistry. Never took a college course in those three disciplines. 85%. Botany, biology, zoology, boy they can dissect a frog. But can they explain the laws of physics? Not a chance.

So our biggest problem has been the teachers. They vanished overnight. The restructuring of our society, the women vanished from schools. All my best teachers were women; they are now presidents of corporations. Used to be the top rung for a woman was a teacher or a nurse and they're gone. They were not replaced. Their equals are gone. That's the problem. We've got to replace them. I think we're starting to get the message. Society is like a glacier sometimes but we better recruit and we better pay them in a competitive way or we're going to remain where we are.

JE: Of course several new technologies were crucial to this. In general the high tech communications to set up instant networks and so forth. The specific technologies that you developed for the Argo and so forth. Is there anything else one could mention in terms of information technology? Is the Argo computer controlled?

RB: Fiber optics, imaging, micro processing, telecommunications. We still haven't got the distribution system. But when fiber optics comes down the street and turns the corner and comes in your house, your roof's going to get blown off. Society is going to change dramatically.

JE: You think primarily because of the bandwidth of fiber optics.

RB: People will redistribute themselves. Why am I going to work in traffic? I want out of here. I am no longer limited. I have free access to the world and they have free access to me through that link so I'm going to Montana. Or I'm going to Vermont but I'm sure getting out of New York for sure. You're starting to see the collapse of cities. They're failed paradise. I'm building a library in my house in Cape Cod, a fiber link. Why am I sitting across the table from you? Why can't I be in Cape Cod and soon as I'm done here walk out in the marsh? That's what's going to happen. Hertz is going to rent robots instead of cars.

JE: Are there people in the groups that you assembled that you feel are particularly key.

RB: All of them. I mean it's selling them on the dream. I'm a quarterback. Is the center more important than the forward guard? No. I need everybody. We need everybody. The bell curve plays. I just need to sell them. They need to share my dream. They need to believe. They need to go over cliffs. They need to jump. They need to be motivated and stimulated. That's my job. I'm a cheerleader. I'm like an orchestra leader. I don't know how to play all those instruments but I know what to expect from them. I know what a good violin sounds like. Can't play it. I'm almost computer illiterate in many ways. Can't generate software. I'm fifty-one years old. I'm off playing this orchestra with people who are infinitely more intelligent than I am at the unit level. I'm dependent upon them.

JE: How did you know where to find them?

RB: Well because I'm not totally stupid. I recruit. I go seek them out. I give them freedom, a lot of rope. Some disappoint the living hell out of me but as long as its only 25%.

JE: You got out and raise money?

RB: I go raise the money. I go look in someone's eyes and say, "I can do it." They know I'll do it. I feel like the Israeli Army, can't loose a single war. And they know that I will go the total distance to deliver, because I have. Its track record. I won't do it unless I can do it. No mountain's worth climbing unless it's tough. Why climb it if it's a cakewalk.

JE: Has the program changed much since you won the award in 1990?

RB: We're maturing. We have our Student Argonaut Program, where we have a competition for students to go, our Teacher Argonaut Program for teachers to go, our interactive developments. We're just growing into it. We're not in full stride. We're getting into secondary networking, better distribution systems, reaching more people for the buck.

JE: Is there any central source of information about the program?

RB: There are videotapes, the brochures, there's curriculum, there's a whole slug of things.

JE: Maybe some material that we could have on research deposit. Any particular thing stands out that you're most proud of?

RB: The kids.

JE: The long-term consequences are the kids.

RB: It's sort of like my grandmother who never went to school in Kansas. One story that stuck with me that's very apropos to the Jason Project is "Great is the person who plants a tree, knowing he'll never sit in its shade". And that's what the Jason Project is. You've got to spend a little bit of your life giving back and not knowing the consequences.

JE: Did the award have any positive contributions?

RB: You say Smithsonian, you say Computerworld, these are pretty heavy-duty outfits. I'm somewhat of a maverick. I'm an experimentalist and normally living on the fringe of my system. I'm not immersed in it. To be rewarded by, to some degree, the establishment is a recognition that maybe you're not so crazy.

JE: Any things on the slightly dark side? That is any things you'd do differently or regrets, lingering frustrations?

RB: No. If I was going to do it again, I'd do it differently because I've learned but that's the only way. I'm always willing just to jump out of the plane and then look for the parachute. Pray to God that someone wrapped it. I think there would be places that I wouldn't go to ask for help where I thought there would be help, like the establishment. You generally start to get help when you least need it. Success has many fathers and failure is an orphan. I've got a lot of people, I guess it's a good sign, that are saying, "I was with you all along". Yeah sure. But anyway.

JE: Anything you haven't covered?

RB: We've pretty well covered the bases.

JE: Well thank-you very much Dr. Ballard. It's terrific.