The National Museum of the Pacific War

Nimitz Education and Research Center

Fredericksburg, Texas

Interview with :

John Goodenough

Meteorologist -Physicist

Newfoundland-Azores

Date: July 29, 2016

This is Mike Zambrano. Today is July 29, 2016. I am interviewing Dr. John Goodenough at the University of Texas in Austin, Texas. This interview is in support of the Nimitz Education and Research Center, archives of the National Museum of the Pacific War, Fredericksburg, Texas; Texas Historical Commission for the preservation of historical information related to this site.

Mike Zambrano: Good afternoon

John Goodenough: Good afternoon. I have to warn you that my service was on the other ocean, rather than the Pacific. I hope that is ok.,

Mike: That is ok. We interview veterans regardless of what theater they were in during World War II.

John: That's fine.

Mike: Can you tell me when and where you were born?

John: I was of American parents in Jena, Germany. I was born on July 25, 1922.

Mike: What were your parents doing there?

John: My father was writing a Doctorate at the University of Oxford and his wife had to have a Cesarean for me to be born and he thought the German doctors would be better than the English doctors. My father was a professor of History of Religion at the University.

Mike: Did you have any brothers and sisters?

John: It is a complicated family that I have. I have one older brother as well as one-half brother and one- half-sister.

Mike: I was going to ask some questions about the depression.

John: Well, my father had the luxury to go and do a Doctorate at Oxford because his father was a Law Clerk and making money in Real Estate in New York in the 1920's so he could afford to send him to England to study. His father lost

everything in the Market Crash of 1929. Of course, he was speculating in real estate and that took quite a hit. He lost everything while my father suddenly found it in that he had to support himself.

Mike: What was his name?

John: My grand-fathers name was Ward Goodenough. I don't know what his middle initial was. My father's name was Erwin R. Goodenough and my mother's name was Elenore Mariam Lewis Goodenough. She was a housewife. Our family was never closely knit. My father had been supported by his father so long tht he developed a life style that was somewhat more than he could actually afford. He had a big house and a big mortgage on it and it was really more than he could support. So, I was conscience, even as a child, that I should be very careful not to be a burden to my parents by spending.

Mike: I understand that you went to a boarding school while in your lower grades.

John: Yes, I went to a boarding school in Groton, Massachusetts. At the time, my father was a Professor at Yale and he was able to get a scholarship for both my brother and I though his contacts. I was twelve and a long way from home. I spent six years at that school. You were ready for college when you got thru there. I started there in 1934 and graduated in 1940. And I was in the Class of 1944 at Yale. I was a child by myself so I selected Math and Philosophy and German. I had dyslexia as a child and I was not a good reader, so I chose subjects that did not require a lot of reading. I managed to graduate Summa cum laude.

Mike: Do you recall where you were when you heard that the Japanese had bombed Pearl Harbor?

John: Yes, I was eating breakfast at the University. It was my Sophomore year.

Mike: Do, you recall how you felt?

John: When Hitler moved into the Rhine, I knew that I was destined to be a soldier. I was trying to get as much education as I could. I knew, I would have to support myself because I knew that my father had got a divorce by the time I finished school. During the summers, I tutored families that furnished me board and gave me enough money to pay for my lodging at school and of course I had my scholarship for tuition During my freshman year, I worked twenty-one hours a week at a suit pressing firm and spend the rest of the time grading papers.

Mike: When you heard that war had broken out, did you have any inclination to join one of the services?

John: Well, I did. I was trying to get my education but as soon as I turned of age that I was required to register. I on my way to register, my math Professor called me over and said, "John, if I were you, I wouldn't volunteer for the Marines, I would go with your friends. They need people with mathematics background to meteorology. I said to myself that I really didn't want to chase a bunch of balloons. I did volunteer, but they didn't call me up until January 1943. The delay enabled me to finish my under-graduate degree. I only lacked one course to graduate, when I was called up and the college gave me credit for my Meteorology in the Air Force for the one course I needed for graduation. It was a good course I had at Grand Rapids, Michigan, during the war.

Mike: Where did you go to get enlisted?

John: It was a small town, whose name I have forgotten. You forget names when you get to be 93 years of age. Now, they didn't call me until 1943 and at that time I went to Boca Raton, Florida. After a couple of weeks there, I was sent up to Grand Rapids, Michigan to take a course in Meteorology. From there we went to Rantoul, Illinois where we completed the course. I was Commissioned in Rantoul. It was an Army base just South of Chicago. The course was very good. They gave you the basics and trained you how to go out into the field and do the job. They were not trying to give you a broad education background. They were

trying to prepare you to do a job and they did that very efficiently. I learned all the basics. When they sent all the Professors out into the field, when we were out there, they would be working on something a half day after we had already finished.

Mike: Was your class very large?

John: Yes, it was a large group. I would guess it was comprised of about 150 people.

Mike: Do you recall of anyone washing out of the course?

John: No, I don't recall anyone being washed out. All of them were pretty good boys.

Mike: Where did you go from there?

John: From there, I was stationed in Houlton, Maine. It was a little village not far from Presque Isle, Maine. I had been there about two weeks, when the man in charge was sent someplace else and I was put in charge of the station. The Air Force sent planes from there up the Northern Route, over Greenland, to England or they would fly over Iceland to Scotland. At that time, Canadian pilots would come and take planes over the Northern Route.

Mike: What type of planes were they?

John: Spitfires, I guess. The Battle of Britain had already taken place by this time and they were sending planes over to England on the Lend-lease program.

After about eight months at Houlton, I was sent up to Newfoundland. I was on the West coast of Newfoundland. At this time, we were sending supplies to England and Europe over the Northern route. In those days, all the planes were propeller driven and they couldn't fly any higher than ten or twelve thousand feet, so they couldn't fly over the weather, you had to fly through it. It was very important that you had radio silence over the ocean and you had to get the plane across with the maximum payload with a minimum gas load that you dared to put in the plane. Consequently; you had better get your winds right. I

had one experience where he didn't think he could make it so he landed in Ireland, and there was a General on board. Now, this was due to an honest mistake. A high pressure cell had unexpectedly come down from the North Pole and, the winds changed. Due to the radio silence the pilot could not be informed that the winds had changed from Easterly to Westerly

Mike: How much advance time could you give that there was to be a change in the weather?

John: You had about six hours to draw up the weather map and see what was going on, from the results you gathered from the borders and one or two weather picket ships out in the ocean. The pilots would come and after they received their weather briefing, they would take off.

Mike: Would these be large groups of planes.

John: No, they were usually individual pilots making individual flights. Normally, the pilots would prefer to fly up to Greenland and Iceland and then across.

Mike: How long were in in Newfoundland?

John: About a year. I was in Newfoundland at the time of the D-day invasion. I remember sitting there and looking at the weather. The invasion was eminent and they were trying to figure out from the weather when they would go. Unfortunately, a Cold Front came through which was a little stronger than predicted.

Mike: I have heard that the weather that was expected in the channel was predicted from the weather from the weather that occurs over Canada.

John: No, it was not quite that way. All the weather moves from the West to the East. When I was stationed in the Azores, for example, the cold Northeast winds would create a cold front that would almost reach down to the Azores. We would get cold showers and have miserable weather.

Mike: What were your accommodation like in Newfoundland?

John: They were fine. We had a bed and good food and they took good care of us. The officers were probably oversupplied with alcohol but otherwise, it was fine.

Mike: Do you live in barracks or a Quonset hut?

John: I lived in a barracks. I was never picky about my accommodation as long as I had a bed. We had individual rooms with a cot.

Mike: In Newfoundland, did you have a Commanding Officer?

John: There was a commanding officer for the base but we didn't serve under him. Our men didn't frequent the base Officer's Club very much. We were a unit on our own and we did our thing. When we weren't busy working at the station or sleeping, I usually was trying to teach myself Russian.

Mike: Why Russian?

John: Well, they were our Allies and there was going to be some inter-action between the Russians and ourselves, after the war. I was interested in doing something and gambling, which I didn't like to do, was the big thing. Consequently; I decided to study Russian.

Mike: Were there many men in your unit?

John: You had a station with about six people and officers. We would have a day shift and then we would have a night shift and we would have a over-night sift and a morning shift. Every once in a while, we would have a day off. Then you could take a walk and get eaten up by deer files. (laughter)

Mike: Were you close to anything? Could you go to a town?

John Not really. There was small town called Stoneybrook which was about fifteen miles down a dirt road along the coast.

Mike: Did it ever snow there.

John: We had a fair amount of snow.

Mike: Did you make any friend over there?

John: Yes, of course. I had friends everywhere I went. I didn't go to the Officer's Club very often but if they had a dance, I would go over there to find a young lady to dance with.

Mike: Were there many ladies to dance with?

John: There weren't many that is for sure. But, that was alright. It was innocent enough. There would be a few secretaries and Red Cross workers and also a few Newfoundlanders. But most of the Newfoundlanders would go out with the enlisted men.

Mike: What did they think of Americans?

John: We were accepted. The summer of 1940, I tutored a family in Murry Bay, Canada. I married a Canadian girl quite a bit later.

Mike: Did you meet your wife while you were in Newfoundland?

John: No. I met my wife at the University of Chicago, much later.

Mike: Where did you go after you left Newfoundland?

John: After about a year, I went to the Azores. First to Terceira and then to Santa Maria. The war in Europe was not finished at time. But it was nearing the end of the war. They still had that tough winter ahead in Holland. It didn't quite break through to the Rhine. The Battle of the Bulge took place while I was still Newfoundland.

Mike: When you were at Terceira, wasn't it part of Portugal?

John: Yes, as was Santa Maria. It was a little larger and more settled than. Terceira was a bigger island and a little bit more settled. Santa Maria was a very poor place.

Mike: Portugal was neutral during the war, wasn't it?

John: I think that any country that said they were neutral were happy to receive a little money for Americans to have a base.

Mike: Can you tell me a little bit about your job in the Azores?

John: We were doing the same thing, forecasting. But there, we were forecasting to get people back home as well to get people to could be Paris or it could be England. I went from there to North Africa one time, but the primary routes were between America and England and went through Newfoundland. The Azores were a natural stop if you didn't go through the Northern Route through Iceland, you would go the Southern Route through the Azores.

Mike: Did the bombers go the Southern route".

John: The bombers went out of Gander on the other side of Newfoundland. I was on the West side of Newfoundland. In the Azores, it was cargo planes that were going through.

Mike: Now, weren't you in the Azores for a while?

John: I was there for at least a year.

Mike: Is there anything that you recall that stands out about being in the Azores?

John: No. I remember the Commander of the base. He grew tomatoes so he would have the proper tomatoes that were nice, fresh and thin skinned, so you would have the proper tomatoes to eat. . That was his contribution and his pride. He apparently was close to retirement.

Mike: Was it a very big base to be stationed at?

John: It was a pretty big base. It was on the coast and our job was to get planes across the ocean. T was at Santa Maria, when the war was over and one of the nurses told me that she was a little sorry that the was over. At the time there were

about 300 men and 6 women on the base. Apparently, it was not too difficult for any of the women to get a date. I though it was an amusing comment at the time. I remember one of my friends was a pilot. Most of pilots were civilian contract pilots. Some of the pilots were trying to arrange their schedules so that they could get home for Christmas. I told them I was sorry I couldn't clear them for the flights because they would not be able to make it because the winds are very strong all the way to Newfoundland. I told them that their planes wouldn't make it. They told me that they were going anyway and they took off. About four hours later, we got back the last one. They said that they got past the last island and saw that they weren't going to make it, so they turned around and came back.

During my time there, everything went fine and I had no problems. I got General Eisenhower cleared to Paris within two minutes of his scheduled arrival time which was pretty good in those days. Now, we normally did not send planes to Bermuda, but on one occasion there was a strong cold front going across. I thought that once the cold front passed there would be no problems so I didn't think about it anymore. Then, I realized there was real cold air behind it and when it goes over the warm water, you usually have heavy thunderstorms behind it. I didn't forecast thunderstorms and it ended up that we had some of the worst thunderstorms of the year. When some of the pilots came through later on, they said, "Boy, you sure did a good job. That was the worst ride I have ever had." This was one of the few times that I fouled up, otherwise I did very well.

Mike: You mentioned Eisenhower.

John: He was flying to Paris and he was going through Newfoundland as it was on his way. I was my job to clear his plane to Paris. To do this, you had to predict when he was going to get there, what his arrival time would be and so on.

Mike: For a plan like that, how long would it take to figure it out.

John: I just predicted the winds and I used slide rules, in those days, in making the calculations. We forecast the winds and the pilots had some idea how long it would take to get there, taking into consideration their air speed and they would predict their ETA. It was just a matter of how the winds affected their flight.

Mike: You were in the Azores at the time the war in Europe ended, do you recall what you were doing at the time?

John: No, I don't remember exactly what I was doing. After all, there were two wars. There was a war with Germany and that came to an end and that slowed down things as far as we were concerned. Then, there was the business of, 'well we didn't know what we were going to do as far as the Pacific was concerned' because that was another thing. You have go back, and remember, President Roosevelts staff was small compared to the President's staff of today. He didn't officially prepare us for war. He did toughen up a bunch of young men with the various programs, such as the CCC (Civilian Conservation Corps.) during the Depression. Consequently; they were equipped to do the job if they had to. Through the Lend Lease Program, he had organized industry. We won the war because of Americas manufacturing capacity. I believe he saw war was coming, but I don't think he saw the attack by the Japanese was going to happen.

Mike: Do you recall hearing about the Atomic Bomb being dropped?

John: I remember it being dropped, but I don't remember having any particular emotional thoughts at the time. I was very grateful that all the boys that were going to have to invade Japan would not have to go, because the Japanese culture was, "You can't be shamed." therefore; you have to be ready to die. An invasion would have been a very bad thing for both sides. There would have been tremendous casualties on both sides, for no purpose.

Mike: Were you surprised to hear of the destruction that the Atom Bomb caused?

John: Well, yes, I had had enough Physics and exposure as an under-graduate in college to realize such a thing could happen.

When the war was over, my math professor who originally, told me to sign up for meteorology course had put my name in a hat for some left-over funds to be assigned to the Quartermaster Corps. to be able to study either Physics or Mathematics at either the University of Chicago or North Western University. I was wondering what I was going to do when I got home. I thought; Here, I have been away for several years and many people had probably forgotten who I was and I would come home and start all over again. I thought well, this war business is so stupid that we need to have people who could work to avoid it but I knew that I didn't like Inter-national Law and I wasn't really equipped to do all the reading that Law student do. Then, I got this telegram saying "Report to Washington in 48 hours." So, I packed up my duffel bag and went back to Washington, D.C. When I got there, they told me, "You have been assigned to Chicago and you have been assigned to a group of twenty-one who have been chosen to go to Graduate School". I thought that was great and I went there. I have a flash back where I was thinking, 'if I ever have the opportunity to go to Graduate School, after I come back from the war, I am going to study Physics'. So, it seemed to me that is what I was supposed to do. I knew that I didn't have the mathematical gifts to be a card carrying Theoretical Physicist but Physics was what I was supposed to do so that what I did, I joined up for two years. Then, they decided, "This is too easy for you. You can continue if you promise to stay in the Army." I told them no, I really want to be a civilian. I left and I had the GI Bill to finish my education.

Mike: You left the Army.

John: Yes, I left the Army in 1948

Mike: So, you stayed on at the University of Chicago.

John: Yes. I had the GI Bill to help me get through. Then my professor (Clarence M. Zener) got a job as head of research at the Westinghouse research lab and he wrote me telling me that he would give me a job when I completed college and he did. I finally could afford to get married, so I did.

Mike: I read a quote somewhere that you said, "When I got to Chicago, the registration officer, Professor Simpson, said to me, "I don't understand you veterans. Don't you know that anyone who has ever done anything of interest in physics had already died by they were your age, and you want to begin." I found that quite interesting.

John: That is exactly right.

Mike: I think that is ironic, considering what you have accomplished.

John: Well I didn't do it quite do it in the kind of physics he was talking about. I am quite a maverick you see and what I did was bring physics and chemistry together in Materials Engineering.

Mike: Just for the record, you graduated in 1952 with a PHD in physics?

John: That is correct

Mike: Who is Clarence Zener that I have seen mentioned?

John: He was a Metallurgist. He wandered around various universities during the war and had a quite a good record of accomplishments. He wrote a book about the elasticity of metal. He was a theoretical physicist and was very well versed in some of the dynamics of physics in metals. He went to University of Chicago.

Now, a professor was not supposed to be involved in your project, if you were working on a thesis. When I went to see Professor Zener and told him I wanted to be his student, he said, "Come back Thursday. I went back Thursday and he said, "Now you have two problems. You have to find the problem and then you have to solve the problem." It is very difference today. A student gets paid and

they have certain jobs to which they are assigned. So, I worked on my thesis which involved hexagonal brass and alloys. It was a modest thesis and when I finished the Professor Zener told me that I was a not a very promising candidate for his program at Westinghouse and he suggested I find a job. I realized I had to do something. So, I decided that I would go to the Physics Society meeting and present my Thesis. I had not defended it yet. I presented my Thesis. When I finished, a little old man stood up and said, "That was very nice young man, but you haven't adequately explained the structure." I went back home in despair and was thinking 'all is lost' and Professor Zener said, "John go back and think about the problem a little more". So I went home and I was able to prove that I was correct in my theory."

Mike: When, our friend, Mr. Richards told me about you, he said that you invented a Lithium ion battery.

John: Are you ready for a little story? Well about 1967 there were two people at Ford Motor Company who had discovered vast sodium iron conduction in a solid, so they invented a new kind of battery. So, instead of solid electrodes and a liquid electrolyte, they would use liquid electrodes and a solid electrolyte. I was asked to monitor what they were doing, so that was my exposure to batteries. But that whole episode turned the Material Science community: How you design a material for better Sodium Iron conduction? That was a new way to think about batteries. Only one had been built and that was in Japan and it was too expensive to maintain and run and so it was not competitive. But it was important. At the same time, I was aware of work in Europe on putting Sodium Lithium between layered disulfide. Put it in and take it out. Now if you want to reach out with a battery, you have to have a reversable chemical reaction. If you can put the Lithium in and take it out that is a reversable inter-action that was dependent upon much Lithium you could put in and how much you could take out to tell how much energy you could store. Then someone in England suggested things you might use in that

phenomenon. They were thinking out of the box. So, they came out with a battery. My Pace maker has a Lithium-Iron-battery in it. It's a non-rechargeable battery. If you have a rechargeable battery, and you use an Lithium Alloy, you have to recharge. No monkey business. When the Mobil-Exon people heard about it, they decided they were going to make this type of battery. The process was not quite as easy as they envisioned it and when complication occurred, the whole program at Exon-Mobil was immediately shut down.

I had worked on Oxides, because I had worked at the Delaney Lab. on my first job and we built with Oxides. First magnetic members, the first random access magnetic memory which is a magnetic memory for the Digital Computer which made the Digital Computer possible. So, I had experience with Oxides and I though; "Well I can insert rather than Oxides I can put Lithium in an item. I had already done that sometime back. And the Oxide will give me a much bigger voltage with the Sulfide so you can play with the Anode side. And I think you have to. If you make the Oxide with a high voltage it means it will be hard to prepare so you will probably have to make it with a discharge after having already gotten the Lithium in, so you won't Oxidize it too much. So you make a discharge battery with this and then there is lots of room to play with what you are going to do with the Anode. That was a radical idea from the battery people in Europe England and the United States and they said that "No we have never made Discharge batteries, we have always made Charged batteries." It was a rechargeable battery and there was no reason you couldn't recharge it after you have assembled it. In the meantime, the people in Japan realized they had a problem with Dendroids. You are doing Inter-collision Chemistry , maybe we can use Graphite. And they used that for a (not understandable) Sony Corporation made the first rechargeable battery so the Corporations made it and they picked it up to make the first Camcorder and the first Cell phones. They have given me credit for the Lithium lined battery. But

we did enable it. I did get the credit but I didn't get any money but business lawyers got all the money, so they made the millions.

Mike: You haven't made any money from it?

John: No, the business lawyers took it all. But, because people make money on it they think that it can now be used for electric cars, which they can almost do, but not quite, there is money to do research in the battery field, so I am in the process, right now, of trying to make another battery which will allow us to have electric cars which will allow us, which will allow us to be independent of fossil fuels.

Mike: Will it be a "Super" battery?

John: If people want to call it a "Super" battery, I believe it will be transformational. But,I don't know. I am very optimistic that we can do something in the next few months, but I have to organize so I can get a little bit of Capital to be able to demonstrate it well enough, somebody will make it commercially. We need to get something. First of all, I solved the Anode problem. Now I know about a system where I can plate the Lithium or Sodium Anodes which will give me the possibilities of a big advantage. But there are still problems to be solved, and I believe that will be finalized within the next two weeks. So, I can tell then tell the investors whether I need some money to get on with it.

Mike: You are not quite there?

John: No, I'm not quite there yet. I want to finish this job and I have another area that I work in that is more fun than Oxides and I would like very much to write a final book as I have just about exhausted that deal very nicely. By that time, to be honest with you, I'm not sure that I will make it beyond 100.

Mike: How does it feel to have done something that will revolutionize the way we communicate?

John: Let's say, I am delighted. Our Technology, that I have contributed to: let me say this: We developed the first RAM memory for the digital computer and from then on, we knew it was just a matter of making it smaller. Now, the battery business, which is critical for new energy business. Which can also be transformational in a different way. I am delighted that I have been able to do something that will be useful to society. I am very conscious that Technology is morally neutral. What we do with Technology is what is important.

Mike: There are bad things you can do with Technology.

John: Yes, there are bad things you can do, just as blowing up roadside bombs, with these are batteries too, you know. We are at a point in that it is a very critical Century. The population world- wide has expanded to the point that the ability to sustain that population is strained. Technology has wiped out so many of the unskilled labor jobs. So we have the problem of how to make the transition of Society when we see this split between the haves and the have nots and the people who do not have the opportunity for education and so on, that are being exploited by the people who have the means and the power. I think the next generation has bigger problem than my generation did. I believe that we had a long slow period of biological evolution, now we have a period of very rapid society revolution, or what ever you want to call it, evolution. The whole process of creation is still going on. We do not live in a static Universe, we live in a dynamic Universe. I have always had the thought that man was developed to turn this earth into a garden not a desert. People have to understand what their responsibilities are.

Mike: Do you still teach in the classroom?

John: No, when I turned 90, I stopped classroom teaching. So, now I get a small stiped that permits me to go on and do research here. As long I am being managed by the University of Texas, they are happy.

Mike: You have been at the University since 1986?

John: That is correct.

Mike: What would your official title be?

John: I am a Professor of Engineering here. I started out in Physics and then I was a Professor of Chemistry and now I am called the Virginia Hays Cockrell Centennial Professor of Engineering. So, I do Material Science Engineering.

Mike: I understand that you have won numerous awards.

John: That is correct; among them was the National Medal of Science for Science in 2015.

Mike: Do you actually get to meet the President of the United States?

John: Yes, It was very nice, he put the medal around my neck and I asked him when did he ever sleep and he said, "No more than you fellows do." I have great respect for the man.

Mike: Is it true that you have written over 500 articles?

John: I have written over 800.

Mike: I understand that your wife has passed away.

John: Yes, she got Alzheimer's about fifteen years ago and she passed away in January. Her name was Irene. Her last name was Wizman is an English name.

Mike: You said you met her at the University of Chicago. What was she studying?

John: We stayed in the International House. It had a wing for ladies on one side and a wing for men on the other. The men and women would eat together. It was a very nice arrangement and I liked it there.

Mike: Is there anything else about World War II and your service that stands out in your mind?

John: It was an experience that my generation participated in. You were a part of a Great affair. You realized that you had to do your job the best you could but you weren't going to solve the whole problem. What gave meaning to your service and gave meaning to your life was that you believed what war was all about but also believed in what you served. So, I came aware with the realization of what gives meaning to our lives is what we serve. I think the service helped me to understand the meaning of that idea. Everyone has to find a meaning of life. Everybody has to find something to serve, whether it is family or country or what-ever.

Mike: I think that wraps up our interview.

John: Alright.

Editor's Note:

John B. Goodenough was awarded the 2019 Nobel Prize for Chemistry

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Floyd C. Cox
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