DR. RALPH SAWYER
1941-1945

Introduction	MUSIC Welcome to the Dahlgren Centennial Celebration – A Century of Innovation. We hope that this and our many other products, events and offerings will showcase what Dahlgren has accomplished during its last 100 years. Throughout our history, we've interviewed some of the most prominent minds, leaders and innovators that have been here, and we're opening up the vault to share them with you this year. Today we are honored to listen to the story of Dr. Ralph A. Sawyer whose work spanned from 1941 to 1945. During his tenure at Dahlgren, he was the Officer in Charge of Laboratories, an early version of the Technical Director position. Dr. Sawyer supervised the construction of new physics equipment and was crucial in the establishment of the Armor & Projectile Laboratory. Let's listen to Dr. Sawyer…
Sawyer	I was commissioned an ensign at the suggestion of Leonard Leob
Sawyer	Well, he was a professor at the University of California, professor of physics. I had known him because in my last year of graduate work at the University of Chicago he was a national research fellow. And in 1941, he suggested to me, since he was getting the A&P Lab started that he wanted spectrographic equipment for quantitative analysis which we were going to build here in Michigan that it would be nice if I would take a commission and then I could come down there for a week or two once in a while and advise them and so on. So I took the commission in May, I think. Along the 7th of June, the following one, which was the middle of the exam period I got a piece of mail, I was coming out of my house to go to an exam. I opened this and all it said was, "You will proceed to the nearest Naval station for physical examination." So when the exam kind of quieted down I turned the sheet over and it said on the other side of the sheet that if I'm qualified I was to report to the Naval Proving Ground on the 15th of June. That gave me eight days after the exam period to get there. So I got there on the 16th of June and I was there until the 29th of July on duty. Leob was there then and he was the commander of the reserve and the A&P Lab had been built and he was ordering equipment and getting ready to move into it.
Baile	The A&P Lab seems to be, in some ways, the fruition of a lot of work that Dr.

	Thompson has put into the station since he came in 1923, I think.
Sawyer	Oh yes, Thompson was the chief scientist there for all that time until 1945 and he had gotten the idea from measurements that had been done from the main proof line that penetration and armor quality, and so forth could be tested in small scale and scaled up. And so he persuaded the Navy, through the Chief of Ordnance to build a small lab which would do small scale work which could be scaled up to save using heavy guns and heavy armor for all the test work.
Baile	That was a critical point, I noticed, in Dr. Thompson's history. It seems that when he came to the station, his development of the small scale testing saved the Navy at a time when proof and testing was losing favor with the government officials after World War I, it seems there was no great allocation of funds for that sort of thing.
Sawyer	Yes, Thompson was very active. He was there for years and he went to the Proving Grounds from a professorship in physics at Kalamazoo College at Western Michigan and I had known him a little there before he went to the Proving Ground. Well, Loeb was ordered down to do this job and then they decided since the university was going to build this quantitative spectrographic job, of which I was the expert that they would release me from active duty and I could go back and get it ready. Then the war broke out, as you know, and shortly after that I got another set of orders. This time somebody had told them that universities had semesters so I got the orders on the 15th of December, I guess, to report on the 16th of February at the end of the semester. When I got there, Leob was gone. I have a memo from Hendrick here somewhere about this on something that I requested. Hendrick said, "Well there was a time sure change – one officer in charge of the A&P Lab left in a rage because I wanted to send one metallurgist out on an inspection trip." I had asked to have sent around and he wanted to send some around and so he was in favor of it this time. Leob had gone.
Baile	Was Leob primarily a scholar?
Sawyer	Well he, yes, he was a scholar, I guess, he was a physicist of considerable repute, of right in California. On the discharge through gases, he wrote a book on it. But he had been in the reserves until 1940 at the University of California for a very long time and he got a lot of physics students into the reserves so quite a number of them turned up at Dahlgren. But he had at least three jobs during the Navy – I've got a letter here I can probably – a friend of mine had written and said that Marney, that's another student of Loeb's, who was my second in command – Marney will be interested to know that Loeb passed

	through here, this was London, had through here under a considerable cloud. He had got fired from three different jobs during the war but he always ended up with another one and was promoted to Captain and did all right.
Baile	Well, it's interesting that a man with this temperament almost prima donna type of temperament could have gotten to be Captain. Did he retire with rank?
Sawyer	Yes, he retired with the rank of Captain.
Baile	The Navy wasn't his full career though, was it?
Sawyer	No, he was a professional physicist.
Sawyer	So anyway, I got back there on the 16th of February and Leob was gone and so was Thompson. Thompson went to the Bomb Site people. He went to NORDEN as director of research and actually discovered they had gotten me back there to fill both of those jobs.
Baile	That brings up an interesting point. In researching your background, you were de facto chief scientist or technical director as far as responsibilities were concerned at that time.
Sawyer	That's right. As far as de facto I was chief scientist then.
Baile	All the hats were on your head? In that regard?
Sawyer	That's right. There was another man name Riffolts. Nils Riffolt. He had charge of a small lab called the experimental laboratory. But he was not a trained physicist, he was really an instrument maker and a smart man with instruments and so on and he had that job and he was there all through the war, technically he came under my supervision but I never bothered him much. What he did really was little jobs for the proof and test work if they wanted something set up, measured or something like a telescope or so on, he did all kinds of handy little jobs for them.
Baile	What size staff did you find yourself working with? What type of immediate

	subordinates did you have?
Sawyer	I think the staff was about 8 or 10 when I got there. A couple of mechanics, a secretary, half a dozen officers.
Baile	And you have been sent here this year to work on the spectroscope?
Sawyer	Spectrographic equipment.
Baile	That was to be installed in the A&P Lab?
Saywer	Yes, I was very active at that time in spectrochemistry in steel. I developed a process here by which we could analyze steel samples very quickly. I mean quickly, they can do it in 30 seconds. We can take a sample out of the steel foundry and have an answer in 30 seconds – an analysis. So Navy wanted a set of that equipment – that's what really got me in there to begin with. Armor steel, as you know, is an alloy steel and it has a half dozen different kinds of alloys in it, widely varying in percents. We could handle a small amount which are also involved in steel. I don't know, I expect that spectrochemical equipment may still be in the A&P Lab. Although they may have improved it, it's been improved since then, we had to do it photographically and develop the plates and read them with a microphotometer. Now they've got a completely electrified electronic readout so it's much faster.
Baile	In assuming the job you took a look at the potential that you saw at the A&P Lab reports and wrote it's primary mission yourself.
Sawyer	Yes, I think I wrote that myself. But on the basis of that it was the, let's see, this is from the inspector, this is from Hedrick.
Baile	In other words, Hedrick didn't interfere with you, he definitely accepted your ideas, as far as the mission of the Laboratory?
Sawyer	I saw very little of Hedrick, I saw very little of the ordnance officer who is the next in charge. I'll tell you how little I saw of him. One of them got me in for some reason, they'd changed every two or three years and he said, "Commander I want to tell you about precedence in the Navy." He said, "Sometime I might be - the Ordnance Officer might be away – and I'd be in charge or I might be away and the Experimental Officer would be in charge and we might eventually get down to where an ensign was in charge." He said he might get an idea in his head and order an air conditioner in his office. He said,

	"I want to tell you Commander, if anybody has an air conditioner here it'll be first the inspector and second myself. I said, "Yes sir" and came back to my office which had been air conditioned for two years. It had to be because we had a big metallurgical lab and you have to have air conditioning to do metallurgy.
Baile	Did he ever find out that you had air conditioning?
Sawyer	No. I didn't tell him – he'd never been in the place. That's how much they bothered me down there.
Baile	That's very interesting because Captain Hedrick definitely had a reputation for being somewhat totalitarian – at best. And why did you think he left you alone, did he have a respect for your position or do think a lack of interest. How did he regard you in your function?
Sawyer	I think he had a good opinion of me but he felt really that this was a proof and test place and that they were there to test ammunition, projectiles, and armor and not to do research work. Let the steel companies do the research work.
Baile	A number of the Chiefs of Ordnance came through Dahlgren a post-graduate officers.
Sawyer	Yes, that's right. And I don't think anybody got much of a chance to be in an RE in the Bureau of Ordnance unless he had been a student officer at Dahlgren.
Baile	I think the experience, from what I've read left a great deal of – made the individuals aware of the necessity for proof and testing and for the developing experimental with our laboratory environment work.
Sawyer	Oh, I think so.
Baile	Line officers seemed to be hostile to the function of a proving ground.
Sawyer	I think some of them do but the people who get at the research office and ordnance work out of the way. I believe it was Arleigh Burke. You've heard of Burke have you?
Baile	I've heard of him.
Sawyer	He had a destroyer division during the war and he was always reporting back to

	the Commander, "I'm proceeding at 34 knots" which was top speed. But Burke, he was very strong on research. I got to know him when he was the research desk at the Bureau and I used to talk to him some and finally he got hold of me just after the Japs surrendered. He said, "I'm going to take you out to Inyokern to see what they're building out there for a new lab. He said the old buzzard can't do anything about it now – the war is over. Hedrick you know how to come to the Proving Ground from a desk in the Bureau and he'd got an agreement when he took the job that they would never transfer anybody away from any reserve officer away from the Proving Grounds as long as the war lasted.
Baile	That would have made him very popular indeed.
Sawyer	I think only two reserve officers got out of Dahlgren during the whole war. One of them was Bradberry – CDR you know, Bradberry's name – anyway he became director of Los Alamos. Parsons took him away. Parsons was there for quite a bit of time during the war as experimental officer. But he was pulled into two or three big jobs, you know, he was on the, mixed up in the atomic bomb and also the remote fuze.
Baile	Proximity fuze, right?
Sawyer	Proximity fuze, on the development of that. One or two other jobs because he was the best scientific commissioned officer the Navy had.
Baile	While you were at Dahlgren did you get the feeling in your work in the A&P Lab that this type of research was going to grow and become more of a factor in Dahlgren and perhaps in Navy itself or did you, was your mind working in that direction at that time?
Sawyer	Somewhere I can find a memo that I wrote to the Commanding Officer at the end of the war and I didn't intend to take the civilian position with the Navy in research because I was convinced their research program hadn't been developed sufficiently. I want something I can say when people ask me. Well, one thing we can tell you right off that's easy, "We developed the process of case hardening STS armor – that's special treatment armor used in thin sheets for splinter shields on 5" guns and for armor airplane protection and all like that. We developed that process, in fact we were probably one of the biggest development in the Navy who use

	that for splinter protection and small arm protection and so on. But nobody knows but me.
Baile	In the same vein it might be interesting to get your opinion on what you consider to be the most significant achievements of the A&P Lab during the war under your supervision.
Sawyer	Well, it's a little hard to say that STS armor was one big one you had to look at. The others you have to pick them out of the air. Here's light armor – homogeneous light armor optimum ballistics properties were obtained in homogeneous light armor by quenching in temperate place to specific hardness. That was the STS job his development heat treatment nickel chrome steel make it possible to treat heavy plates for uniform structure regardless of plate gauge.
Baile	Going back a little bit – in your naval career you were in service – the Navy for about – prior to World War II, weren't you? You have a longer history then.
Sawyer	Well, I was an ensign in World War I, would you believe? I was as that time a graduate student. They were anxious to have someone who knew something about optics, and they sent me to Bausch-Lomb Optical Factory in Rochester but they told me that the Navy was just commandeered a small optical factory in Rochester. The only technical man there is German trained, German born and German trained men and they don't really trust him – they expect you to take over the factory. So I worked furiously there for about a year learning the optical instrument business – learned a lot about it too – Then the war ended and this suspect scientist – they moved the whole lab, the whole factory down to Washington Navy Yard and took him along with it and he spent the rest of his career until he retired as a civil servant. Did you know anything about Clint Bramble?
Baile	Dr. Bramble? I only know that he was, I think Technical Director. Chief Scientist or Technical Director, perhaps the name is a misnomer but he was the chief functioning civilian scientist at Dahlgren for a time.
Sawyer	That was right after the war. He was a professor at the post graduate school at the Naval Academy. During the war he used to come to Dahlgren two or three days a week on detached duty. Which was a nice little arrangement for him, I'm sure. But after the war, he was at Dahlgren full time as Director. I think this was because the PG school move to California and he didn't want to go there.

Baile	Did you know him during his tenure as chief scientist at Dahlgren?
Sawyer	No. Except that right after the war there was this advisory committee that used to meet there two or three times a year and I used to see him when I was down there on that. I was on scientific advisory committees at a number of places – Inyokern for one, Dahlgren.
Baile	The advisory concept, are you familiar with the history of the advisory committee? Evolution of it?
Sawyer	Well, I know that Thompson was a strong believer in getting some outside advice and he set up the advisory committee at Dahlgren and when he got to Inyokern he set one up there. All right, I was on one or two other advisory committees and consultant committees some of which did good things and some which didn't. And I was on two committees of the Air Force which were instructed to recommend reorganization of scientific work of the Air Force. The reason I was on two was because what the first committee recommended didn't stick and so they appointed another one.
Baile	In pursuing that point you mentioned earlier in response to my question concerning when Dahlgren began to noticeably delve into R&D, you mentioned the advisory committee or advisory council as being an indication of that?
Sawyer	Well, I think that advisory committee was probably worked up between Thompson and Bramble.
Baile	Do you have a statement on when you may have felt R&D became noticeable at Dahlgren as a separate function?
Sawyer	I think that it was after the war, Hedrick thought proof and testing was the only function they had and I think the A&P Lab had been pushed down his throat by the Bureau of Ordnance more or less. We didn't particularly have a lot of work but certainly got all of the officers that I wanted. I know people at the Bureau of Ordnance and every once in a while I'd get a telephone call or a memo from one of them that they'd got a very good man and would I like him?
Baile	The Bureau of Ordnance was aware of your specialized needs?
Sawyer	Yes.
Baile	Then that was not going over Hedrick, it was sort of ignoring him wasn't it?
Sawyer	I never got any complaint from him when somebody turned up there. He probably didn't read my hand in it. I mean I wouldn't have stayed there if he

	had known that I was going over his head a little bit. Although we used to talk to the desks of the Bureau of Ordnance regularly, had to of course. They knew what they were doing and we knew what they were doing, partly through those reports but more through telephone conversations that I would have, or would have other people in the lab. Johnson probably. Johnson and Wiemann were two of the best men I had.
Baile	Jerry Johnson became first Director of Naval Laboratories
Sawyer	Now he has a big job in D.C. and Wiemann was getting to be the hydrographer of the Navy. But they were my gunners – 3" guns – Wiemann and Johnson were gunners. They fired the 3" guns all through the war. They didn't get any real scientific work. But you know we had a 3" gun and we could fire an awful lot of rounds.
Baile	Yes, the 3" caliber seems to be very significant in the history of Dahlgren before Thompson began with the scaled down 3" study.
Sawyer	Yes, in all of these reports you can see a lot about the 3" gun work which kept going all the time.
Conclusion	Thank you for listening to this week's Dahlgren Centennial Podcast, and hopefully you have learned another interesting aspect of what our people accomplish for the Navy and for our nation. We will continue sharing how Dahlgren is a one-of-a-kind location where innovation is heralded as the hallmark of each individual. <u>PAUSE</u> Tune in next week to hear from Robin Staton whose significant work at Dahlgren spanned from 1969 to 2015. Much of his work was focused in electronics, electromagnetics, and radar. Thank you for celebrating this century of innovation with us at Dahlgren. <u>MUSIC</u>