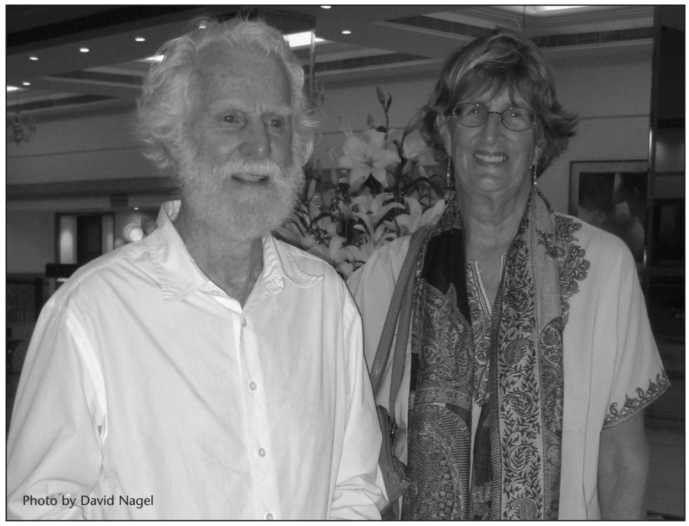
Roger Stringham and the Walrus

Marianne Macy

It was Sivuqaq the Walrus who helped illustrate what Roger Stringham was doing with his cavitation and fusion work.

Roger Stringham is one of the early and original cold fusion researchers; he and wife Julie Wallace are familiar and beloved figures at conferences and among the many researchers Stringham has worked with. Originally a Mountain View, California-based chemist (his lab was walking distance from where ICCF24 will be held in July 2022), Stringham's early experiments were pioneer in using ultrasound, which generated bubbles in D_2O whose expansion and contraction matched the frequency of the ultrasonic generator. The compressed bubbles resulted in gas that became high temperature and emitted light. He used heavy water with a sheet of palladium and found excess heat. Stringham noted that at the ICCF3 conference in Monaco (1992), Martin Fleischmann understood his novel method and said, "It's all yours, Roger," implying that Stringham's cavitation was different from his electrochemical bubble at the cathodes. The process produced 60 watts of excess power for 19 hours and generated 10^{18} atoms of helium.



Roger Stringham and Julie Wallace at ICCF16 in 2011.

In an ICCF10 Poster on Cavitation and Fusion,[1] Roger Stringham described the process this way:

> Natural cavitation phenomena in D_2O using piezo devices is now amplified initiating DD fusion events that produce heat and helium. We have adapted it for our use. The transient cavitation bubble, TCB, has been harnessed to produce high densities of deuterons, 10^{25}/cc. An electrically driven piezo device filled with D_2O produces acoustic field generating TCBs that are, in the final collapse stage, micro accelerators. The result is the implanting of deuterons into a target foil producing ^4He originating from the Pd Foil and T from the Ti foil. We are an emergent tangent technology to sonoluminescence, SL technology, which we use to give us an environmental parameter probe into the bubble contents at the moment of its highest energy density. Much of the SL studies center on the pulses of photons coupled to the irradiating acoustic field emanating from an oscillating single stable cavitation bubble, SSCB. The generation of these photons relates to conditions for the target implantation process. Recently we have been studying the effects of frequency on multi TCB SL conditions that produce fusion. These experiments and the analytical methods have concentrated on the mass spectroscopy of reactor gases, calorimetry of the reactor and power supply, and the scanning electron microscope photographs of target foils. The results from many experiments are pieced together to reach a plausible path for the TCB that terminates with deuterons implanting into a target with the resulting fusion events. The use of SL for monitoring the bubble content's high energy densities allows for reactor parameter management for fusion events in the target foil. Studies of multi TCBs SL at higher temperatures, (300-450°K), external pressures (10^6 to $10^{7.5}$ dynes/cm^2) and frequencies (.02-1.17 MHz) are proceeding in a search for better fusion environments.

Robert Godes, founder of the company Brillouin Energy, described Roger Stringham's system in a 2015 paper entitled "The Controlled Electron Capture Reaction Model":[2]

> Heat in a system is an indication of phonon activity. Even ions impacting and entering the lattice contribute to phonon activity. It is this passively generated phonon activity that causes the reaction to run in existing systems where grains and dislocations allow superposition of a sufficient number of phonons. One exception to this passively generated phonon regime is Roger Stringham's sono-fusion devices. These devices appear to produce localized "Gross Loading," an explicit source of phononic activity and possibly electrons, but in an uncontrolled form. This over-

whelms the lattice's ability to absorb the phononic energy released in the Quantum Fusion/neutron accumulation events.

Godes employed a quote from Stringham's ICCF10 poster:[1]

> When a fusion event occurs, it usually takes place deep in the foil just after implantation, generating in the trap an energy pulse that follows a channel of heat production rather than a gamma or some other energy dispersing mode. The heat pulse travels to and erupts from the surface as ejected vaporous metal with the resulting formation of vents in the target foil. These vent sites are easily found in FE SEM photos covering the foil's exposed surface.

Godes concluded, "One must assume that the path traveled is the one created by the plasma jet impinging on the surface of the foil. Roger's device also produced clear evidence of ^4He production at LANL [Los Alamos National Laboratory] in New Mexico and starts to produce reactions as soon as it is turned on. This is clear experimental evidence that the reaction is not limited to a surface effect."

Roger Stringham has continued his work for the full run of the cold fusion history. What follows here is his background, and sections of interviews he was kind enough to do.

The Walrus

The LENR community was separated from each other during the pandemic, with labs and offices closed. Meetings were online. One day my attention was captured by Katherine J. Wu's story in *The Atlantic* magazine about the only male walrus able to breed in captivity.[3]

When Sivuqaq hit maturity at about age 13, Wu reported, "he felt the same biological pangs as his wild counterparts, and began to score the California springs with his strange sexual soundtrack." His underwater claps—documented only in captivity—were his "most distinctive behavior," Leah Coombs, a Six Flags walrus trainer who had worked with Sivuqaq since his infancy, told Wu. This clapping was so loud, Wu noted, that it "pierced through gallons of saltwater and inches of plexiglass, drowned out the chatter of park-goers, and reached the ears of people well outside the exhibit where he was housed."

Colleen Reichmuth, a biologist at the University of California (Santa Cruz), worked with Sivuqaq until his death in 2015. His clapping, she told Wu, was "right up there with the very loudest biological sounds ever recorded underwater." Reichmuth wanted to find the clap's mechanical roots. For three years, she and Ole Larsen of the University of Southern Denmark recorded Sivuqaq's underwater behavior. They reported in a 2021 paper[4] that the walrus "accomplished his flippery racket through a phenomenon called cavitation."

Wu wrote: "Cavitation works only in fluid, and it is a fierce process, in which an object moves so quickly through water that it forces bubbles of air to materialize in its wake." Jason Dinh, who studies marine acoustic communication at Duke University, noted, "You're getting the liquid to a point where it experiences a phase shift into a gas." The bubbles then collapse, releasing lots of energy, and an "impulsive, firecracker-like noise." Dinh echoed Reichmuth's statement above, indicating, "It's actually about the limit of intensity of a sound an animal can produce underwater."

The story went on to detail how Sivuqaq and his enthusiastic, cavitation-producing clapping succeeding in entrancing his two female tank mates into mating with him. This story and the scientific paper immediately made me think of Roger Stringham and his cavitation work. I sent it to him in Hawaii, where he has lived since 2000. In addition to our previous long interviews, this story sparked a year of wonderful correspondence in which I learned the extraordinary background that this most modest of scientists had not previously mentioned.

The scientific paper and *The Atlantic* article detailed how valuable the walrus became in advancing knowledge about mechanism of the noises a male walrus would make to advertise his size and physical capacity to potential partners, as well as exhaustively analyzing decibels and phase. But Roger Stringham, the cavitation expert, nailed the secret of Sivuqaq's success: "The force of the cavitation is giving the female walruses orgasms."

Roger Stringham Biography

A bearded, friendly and fascinating character, Roger Stringham came from a very distinguished family. Jeremiah Day, his great-great-grandfather, served as President of Yale University from 1817 to 1846.

Timothy Dwight V, President of Yale from 1886 to 1898, described Jeremiah Day as, "a wise disciplinarian, a judicious governor, a thorough and accurate scholar, a valuable teacher, and a man of intelligent and penetrative mind."[5] In 1814, Day published *An Introduction to Algebra*, which had many editions. This was followed by works on trigonometry, geometry, and the mathematical principles of navigation and surveying.

Roger Stringham's paternal grandfather was involved with missionary work in the Pacific Islands. Interesting, as Roger ended up living on the north shore of Kauai. His first wife was an airline stewardess for TWA, which gave her and relatives stand-by passage on any airline anywhere. "So we visited all the Islands, and the north shore of Kauai in 1960 was a surfers' paradise," Roger said. "We bought a house with 200 feet of beach frontage for $20,000. I think it was $105 a month. Sixty years later I live in a 'mansion' looking down to the ocean." I asked Roger if he knew my heroes, big wave surfer Laird Hamilton and his Olympian wife Gabrielle Reece. "I knew Laird before he was born!" Roger exclaimed. "I rented a house to his parents when his mother was pregnant with him!"

Roger Stringham comes from an academic and artistic background. His mother was a commercial artist and father an architect, astronomer and photographer. "I started drawing when I was six and building model airplanes a few years later," he remembered. "I was fascinated by airplanes. At age 18 or 19 I enrolled in art school and did my first watercolor painting. A year later and a week after the Korean War started, I was drafted into the U.S. Army, where I did drawings in my pup tent or sitting on a rock that I sent home with a letter once a week. I really learned how to paint during my six months in Sendai, Japan painting on my footlocker in the barracks of Camp Schimmelpfennig."

If Roger Stringham had not chosen to be a scientist, his painting, watercolors and sculpting are extraordinary and he could have been famous in the art world. The cover of this issue is one of his watercolors. The Korean War Legacy Foundation highlighted Roger's work on their website.[6]

Roger Stringham's time in the Army during the Korean War was a trauma he held all his life and exorcised by making artwork about it. Recently, Roger self-published two hardcover collections of the sketches he sent home from his year in North Korea. They show active combat duty and yet also sketch the peace and beauty of the countryside and villages they traveled through, with Roger's diary entries scattered throughout. In "Night Patrol 1951 Kunsong Area," Roger writes about the experience. "The sketch shows moonlight night silhouettes of men on Patrol before the winter snowfall. We can see ourselves as silhouettes on the ready, as we move through deserted buildings and across fields. Sometimes the people leave bowls of warm food for us, but we never see them. These are people that we are interested in talking to, they become shadows in the night."

The second book has his sketches, which his family had saved and mounted, and photographs of his unit from film shot with a PX camera that had been provided—"a typical front-line experience setting up a new position on an old site," Roger reported. He found the film stuffed in a bag 62 years later and decided to prepare these books of the photos, sketches and stories of his friends and the events that occurred in that year. Roger Stringham's sketches are beautiful, haunting and an incredible record of this time in the Korean War. Looking at them all these years later, he wrote, "What I did in the Army was to enclose a sketch of the local scene in the mountains of North Korea with each letter I sent home. These sketches unknown to me at the time were exhibited in the San Francisco Museum of Art. And four years ago I found these sketches and put them in the two books. It was very, very cathartic for me but also unsettling."

Roger recalled, "In North Korea one evening I saw a beautiful young woman in white running through last light of the day into the forest, disappearing forever. That was my only contact with the opposite sex. I was drafted for two years, with the last six months of my Army time in Japan, a country in culture shock, just after their atom bomb defeat. We faced certain death but came through the other side. Or was I in a dream of non-reality still with the dead carcasses, smoldering in the mud of war on October 18, 1951. It was over and I was safe."

The last year of Roger's service in the Korean War found him stationed in Sendai, Japan. He would return to this place in 2016 for the 20th International Conference on Condensed Matter Nuclear Science (ICCF20).

Roger said, "I was 21 years old when I was discharged from the Army and was something of a hero. I did not know what to do, I was not the same person. UC Berkeley was there and the GI Bill available, so I enrolled in the study of Chemistry and that was my introduction to science. After graduation I took a two year painting trip around the world. That was followed by a job offer from Stanford Research International, SRI, where both Tom Passell and later Mike McKubre worked. This was all back in the 1960s."

Roger recalled the California of the 1960s: "I was friends with Ken Kesey, who wrote *Sometimes a Great Notion* and *One Flew Over the Cuckoo's Nest*, which was about what went on at the veteran's hospital at the bottom of the hill, so I also knew the psychedelic bus scene and the Merry Pranksters. I spent time with Janis Joplin and became good friends with Stewart Brand, the editor of the Whole Earth Catalog."

Roger's first wife died of cancer during this early time in California. In 1979 he met Julie Wallace and they've been married since 1981.

Roger noted, "I bought a log cabin in the Redwood Forest ridge looking East down on SRI and Stanford University and West out to the fog banks of the Pacific Ocean." It was at this site that Roger later set up his lab, known since the late 1990s as First Gate Energies.

Roger said, "It was almost 30 years later in 1989 when we had the Fleischmann and Pons announcement from Utah of an unexplainable heat from an electrochemical source, palladium in deuterium. With some inherited money I bought a sonication device and learned what it could do."

Roger reflected on some of his cold fusion connections: "Dick Raymond and I became close friends at SRI. Raymond worked in the Business Management Division and I worked in the Physical Science Division and every noon we would play basketball and Mike McKubre and Fran Tanzella would play soccer at the nearby Burgess Park. Dick Raymond helped the Whole Earth Catalog in the intricacies of finance and publishing. He was the founder of the Portola Institute. He was also the President of my lab." Roger said that Dick Raymond chose the name First Gate.

Continuing with his cold fusion comrade narrative, Roger added, "Tom Passell had just started work for EPRI, a utility consulting group for power plants for the U.S. After the Fleischmann-Pons Utah announcement, Tom was able to get EPRI to fund some work, including my own. That gave some momentum to LENR around the world that is still going strong today. We should not forget this initial contribution."

The scientists knew each other and compared notes and mingled, in the Bay Area and at conferences. "In the early days Giuliano Preparata came to my lab in the Redwoods to check out what I was doing, along with Prof. Peter Hagelstein, Gene Mallove and many others...I moved my lab from my home in the hills to an industrial park in South Palo Alto to a 2000 square foot lab where Google is now and and I commuted those 20 miles from the Redwoods every day. Prof. Jean-Paul Biberian was at UC Berkeley on his sabbatical at that time."

He continued, "I never told anybody about my connection to UC Berkeley. My grandfather was Washington Irving Stringham, who was a Professor of Mathematics and Department Head there from 1882 until his death in 1909." According to his grandfather's death notice, he was an interim President of the UC system for a short time while President Benjamin Wheeler was away.[7]

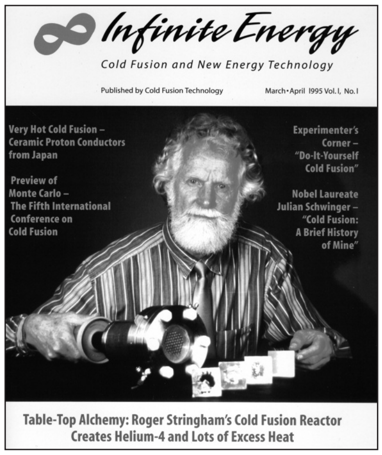
Roger noted, "So Jean-Paul Biberian got First Gate's experiments into the UC scientific instrumental facilities. It was a strange feeling but nobody knew until this year that I had that connection to UC. I told Jean-Paul this year that I did not want the extra pressure it might have brought when I got my degree there in Chemistry in 1957."

"I have had some help in the lab from people like Biberian, Russ George and Kim Nunlist...Without their help the cavitation research results might not exist," Roger said. In recent years, Roger Stringham and Tom Claytor (retired from LANL), have worked together.

In 2000, Roger Stringham and Julie Wallace moved from California back to Hawaii, where his work continued. The interview that follows examines aspects of that progress. (More with Roger Stringham will be forthcoming in *IE*.)

— Interview with Roger Stringham —

Marianne Macy (MM): I looked and found you are in the first issue of *Infinite Energy* magazine to be published. I've been reading your reports, papers, looking at your videos. You have been involved with this field for so long.



Issue 1 of *Infinite Energy*, released in 1995, with a cover story about Roger Stringham.

Roger Stringham (RS): I have all this information and continually mull it over and put it back together in a different way and it grows. I think better if I draw things. It stimulates my mind if I can put it on a piece of paper and draw it. I have all these intricate drawings of how things should look that I can relate to those things and draw from them. Basically this is a growing mechanism.

MM: I saw that you originally were an artist so it makes sense this is your creative process. Did it help you to go back over that material for any relation to what you are working on now? You showed me in Padua [2015] that you had a tiny hand held reactor. David Nagel said you have a shoebox-sized reactor now. I was curious how significantly different your work now is from the early work? If I understood correctly, you are getting excess heat. Do you have neutron measurements?

RS: In 1993-94, our apparatus was quite different. It filled up a big table and was done at a very low frequency, 20 kHz, and I'm now in the megahertz range. It is different but a continuous change. I started out with a system that weighed 50 kg. Now my current system weighs 5 kg…much smaller and I think it is more flexible. I get the same amount of heat as I did with the big one, so it is much more efficient.

MM: How much heat does it look like now?

RS: I was getting 65 watts in Los Alamos and what I'm doing with the little one is 40 watts, the one I showed you in my hand.

MM: The 65 watts at LANL, that was the previous reactor?

RS: The heavy one weighed 50 kg. The heavy one got 20 kHz. It saves me so much money.

MM: Where are the costs?

RS: Not as much costs for materials, support systems; everything else is much less expensive.

MM: Dave Nagel gave me a remarkable figure for the approximate cost of your new reactors, which he said was approximately $50?

RS: That sounds right. Isn't that amazing?

MM: It is amazing to me working on this to hear this description. What stage is it at? What needs to be done next? How close are you to getting this technology out?

RS: I think it could be ready. There is so much more to do. I was always hampered by not having enough money to do the analysis for helium at the higher frequency pieces because of the cost. Every so often I got a break and someone would give me some funding and I would get an analysis.

MM: Who is doing it now?

RS: I don't have anyone doing it now. I am carrying the load for awhile now. Tom Passell was instrumental in getting great analysis at LANL a long time ago. I have an article in *IE* this coming December.[8]

MM: Yes, it's a good piece, that report on the work done in 1994. I wondered if you had decided to publish it so people would realize what you've been able to do and the capacity of your system.

RS: That is true; it is related to current work. I am quiet and don't market my work, so I never get a chance to talk about it. I was going over the work and the old stuff is pretty good. I found some things I hadn't put together before. At times there has been real chaotic stuff going on with my work and I just overlooked it. I saw some relationships I hadn't seen before and I think I got it better the second time than I did the first.

MM: If you were to address the work featured in *IE* #124 and your work now, what are the significant relationships between the work? What needs to be called to people's attention?

RS: Several things. I think helium is definitely the ash that people speak about and so is tritium. I could talk a little bit about it but have to be delicate because Tom Claytor is involved in recent work and has signed a non-disclosure agreement, but there is very exciting work I think he is doing with the little reactor and he has branched out on his own partly with another group and they are progressing and I'm so happy he is doing that. He is not following my path, he has his own path.

MM: The work that Claytor is doing, does it incorporate your little reactor?

RS: He started with my reactor but has improved it. His calorimetry is so different than mine, which is rather crude. He uses a Seebeck calorimeter, which cannot be argued with. I do flow-through type calorimetry and there is some argument there.

MM: Just to trace this…He started out with your reactor and made his own technology out of it? Is that what I should understand? Or is it still your technology he is developing?

How does that work?

RS: It is still my technology. He is approaching it in a different way. He has to do things more quickly and I do things over a longer period of time. I am looking at a steady state type of system and he is doing something that works much faster, looking at a two-minute time frame.

MM: What is occurring in that time frame? The whole reaction occurs in two minutes?

RS: That's the whole thing. That is to make the measurements, measuring by products, that is how much time he allows himself.

MM: Does it come up in that time in the same way it does with yours?

RS: Yes.

MM: That's remarkable, isn't it?

RS: I thought so. I didn't think it could be done but it can. I was there. I set up the little reactor to run under those conditions but I was not sure it would work. That was two years ago in December.

MM: Why wouldn't you use the same method? Is it a matter of equipment?

RS: It's a matter of calorimetry. That is the key. I can't do the same because he has the Seebeck calorimeter.

MM: I reread the first *Infinite Energy* cover story on your work—that is to say, the first issue of the magazine, in March 1995. The whole thing of ultrasonic cavitation: Are the basics of your new small reactor and how it works close to the way that the E-Quest process worked? What are the similarities and differences that you can discuss?

RS: Basically it is the same thing but I've just upped the frequency, that's all. Nothing has changed.

MM: Could you describe that a bit?

RS: I started out at a low frequency of 20 kHz and did a lot of work but saw the foils were getting so badly damaged that a lot of the results I was getting were, over a period of time, I couldn't tell when the operation was stopping. Because the foils were damaged to a point where they were no longer functioning. I ran them to death. The numbers I was getting over that period of time, the average energies and products I got out were probably…well, I was not picking the ripe fruit. I was picking the fruit that had rotted, to use that analogy. It starts running, looks good and there is a decay process and I wasn't aware of what was going on in the reactor. I have some videos where you can actually see the circuits melt and become shiny and dissolve into the D_2O.

MM: Is that work you did with John Dash or was this later?

RS: I was doing this in 1989-92. That is when I started and I had some people at SRI helping with mass spec and other analysis. I worked at SRI for a long time.

MM: I hadn't remembered that until last night when I went to reread material on your background and was reminded of that. It looks as if your work at SRI involved MRI?

RS: It was high resolution spectroscopy, that was what they called it, but it was MRI; it's high resolution nuclear magnetic resonance (NMR) spectroscopy. Varian produced the first instruments and SRI got one of the new ones. Now we would say it barely worked so I got in on the ground floor on that. That was probably my specialty.

MM: How did that help with what you ended up doing?

RS: The whole time I was there I carried it on and later spent 15 years at Science Applications Incorporated, that was in the same area and I worked there for 15 years also. I always had the high resolution NMR connected to the work I did.

MM: Those diagnostics helped?

RS: Yes…I'm no longer working in sonofusion. I have a new approach.

MM: That is interesting because sonofusion was what you were working in for so long. So what does your new approach involve? How did your work morph from sonofusion to what you are working in now?

RS: I am going back to my old NMR days, radio frequency phenomena instead of acoustics.

MM: What are the advantages?

RS: I have been working on it for two years and testing it out now. Haven't really used any D_2O. I'm just testing out the system. In a month or so I can try D_2O and see how that works, just working with water, which is a good test but light water has its own characteristics. I am using it as a beginning point to get my system working. D_2O is too expensive and hard to get to Hawaii. I have to get someone to smuggle it in!

MM: That's true! I forgot those complexities living in Hawaii. Do you think the system will work as well as your old sonofusion system?

RS: Everything is going to change if this works as I think it is. It's speculation…I have put a lot of energy and work into it but can't talk because I haven't done the critical work. I just set it up so it will be obvious the first time I try it and it will guide me. I can do the same thing as the acoustic input but this is a much easier system to handle and provides a lot more energy…It provides better bubbles.

MM: So you are still using the bubble part and cavitation?

RS: Yes, I'm using the same technology, bubbles and cavitation but just the energy input is different. Everything I learned will apply. One important thing I learned is the bubble changes greatly in size and the energetics of the bubbles stay the same but become smaller and denser. The energy density is the same and energy density is so important. I find I don't damage the foils because the energy inputs in each bubble are much less. Instead of making these big craters that I got with 20 kHz, you barely see the damage. It's probably a million or billion times less energy in the bubble but the energy density is the same.

MM: What is the mechanism that makes that happen? Or do we not know?

RS: It makes sense. There is a selection process that goes on with cavitation. At higher frequencies, the frequencies select a population of bubbles that is much smaller. At first the cavitation puts out bubbles of all sizes. The higher the frequency, the selection process will pick out smaller and smaller bubbles as you increase the frequency.

MM: You did experiments of changing the density by changing the frequency, yes?

RS: Yes, this is what I've been doing the whole way through. I went from 20 KHz to 40 KHz to 1.1…

MM: I apologize, Roger, I asked the question wrong. I meant, if in your new system if that has made it easier. You said the new system is easier to handle and it provides more energy and better bubbles. I was trying to get a fix on how that works.

RS: It is producing better bubbles because it is producing more bubbles…bubbles of the same energy density as you increase the frequency; the selection process takes just those bubbles that match the frequency. It's a frequency match. That's what drives this process—matching the frequency to the size of the bubbles. It will select the bubbles, and if you have a lot of small bubbles, it only selects the small bubbles of a particular size…It only selects a few out of the whole population of the cavitation system.

MM: Can you control it? I read a line that stuck with me in one of the articles about you where you said, "It is sort of an art."

RS: It is sort of an art, but you can control it. Nature controls it; I don't. I select the frequency, which is pre-ordained. The frequency depends upon the piezo and each piezo will have its own resonant frequency. You can choose whichever frequency you want but back in the old days you were stuck with an oscillator that was just operating in a narrow frequency band. You were limited. The system I use now, I tune it. It's a tuned system. You couldn't do it before, you were stuck. You would have to build a whole new system. That was very expensive.

MM: How long have you been using this part of the system that results in this?

RS: I've been using this new system for two years, since I came back from LANL. I discovered it but I'm sure the discovery is not unique, it's just how I'm applying it that is unique.

MM: Could you expand on that, Roger? What specific applications did you make? Applying it to the bubbles in sonofusion? What specific uniqueness did you use?

RS: Radio frequency interference has been known for a long time. It does interfere with making temperature measurements. One always has to be aware of radio frequencies and temperatures and using devices that are free from radio frequency problems. What I do is: I pulse the system off and on. It has a run mode and it has an off mode. You pulse it and you make measurements in the off mode and let it do its thing in the on mode. It can have a very high radio frequency in appearance. You can never look at the temperature measurements; they would never make any sense at all. They are just all over the place.

MM: You mean, when it's in the ON mode that radio frequency problem is happening, but when it's in the OFF mode, it's not?

RS: That's right.

MM: So that is your unique application.

RS: That's right.

MM: Did you learn that by experimenting with it over time? Did you figure it out that way?

RS: It hit me like a block because the radio frequency is what you use for high resolution NMR.

MM: Of course!! Of course!

RS: That's what I said!

MM: My father is a radiologist so I grew up with this stuff. But I have never heard of this application. It is extraordinary.

RS: Yes.

MM: This could open up a lot of people working on this…

RS: It could open up a lot of things. That's right.

MM: What else would come into play? Can you explain for the audience how you realized the workings of the high frequency NMR work, and how you came to realize these things might be related? Can you enunciate the similarities?

RS: With high resolution NMR you find the right frequency for the nucleus and you find its radio frequency resonance, and each isotope has its own resonance. People started looking at the hydrogen resonance and build a machine around that. You use a big radio frequency and you pour that into the nucleus and you look at some effects because that stimulates. It is very sensitive to frequency so if you get the right frequency only hydrogen absorbs this energy and then desorbs and you get signal out. That is what you are looking for. Those changes in the hydrogen signal give you a picture of what's going on in the nucleus. Hydrogen has so many organic molecules. The way the hydrogen is bonded changes its resonance just a little bit. You pick up the signal…Depending on the relationship there is an interaction and you get these very complex, beautiful spectra and can analyze and identify the various parts of the molecular response. It is very clever and it's a great analysis. It is not as sensitive as you like. But it is changing all the time and can be more sensitive. I am not up on current work so I don't know what they are doing now. I was fascinated by this when I was working on it but I am rusty for not having thought about it too much.

MM: But you did think about it in terms of how you could do the pulsing and how you could turn the system on and off to accommodate that? I don't think anyone in LENR has used these frequencies in this fashion…

RS: No, I don't think so either. I haven't seen anyone do this, although the technology has been around for a long time and is very highly developed. I could profit a great deal from using it. I built my own little system which is not too expensive. It is around a little piezo and it resonates around 1.6 MHz, which you tune into exactly depending upon its environment. Maybe 1.5, 1.6, 1.8…in that neighborhood. You have to tune it like you do a radio to get it on the station.

MM: We were also talking about how radio frequency had previously interfered with the temperature measurements. So now that you have a better method for looking at that, how has it helped the system run?

RS: It gives you a lot more and better flexibility and more power in than the acoustics, so it is a much more powerful tool. I think it can make smaller and finer bubbles. We just have to see. I've done the groundwork and now I'm ready to try it.

MM: I want to ask something about cavitation. I was rereading about Lord Rayleigh's work. It said "the bubble collapses to a minute fraction of its visible size, at which point the gas within dissipates into the surrounding liquid via a rather violent mechanism, which releases a significant amount of energy in the form of an acoustic shockwave and as visible light." Then the temperature can go up to several thousand Kelvin and the pressure to several hundred atmospheres. I want to ask about that visible light. I have talked to a friend of mine who is an inventor and he talked about seeing those large boats with powerful motors that ride high in the water. He said he's seen light shooting out from the propellers.

RS: If it isn't bioluminescence of material in the water, there is another kind of light, which I've worked with for a long time. I'm familiar with sonoluminescence and what it might mean. To me, when you have light coming out from a small entity like a bubble collapse produces, that light is of a particular frequency. It has a frequency range that relates to the temperature and origin of what the bubble is. It seems to be towards or in the UV. This means it must be a pretty hot process. That's only the initial part of my process. Besides the light coming out, there is also the jet…and that comes off and that's where the damage is.

MM: The jet that bores the hole in lattice?

RS: That's what I'm talking about. The jet is quite powerful and if it's near a metal surface or surface of some sort it will damage it. But with the smaller bubbles, the jet is smaller too so it doesn't do as much damage. So you can use it, your operation is much better.

MM: I'm getting it…You said your system had more energy. Instead of blowing the foil apart or making those big explosions you see in the slides, you can just get it into the lattice without as much damage. Is that what is going on?

RS: Yes. It goes into lattice much cleaner. So that is using the high frequency that gives you this big advantage. These jets that are made have much fewer deuterons in them. The jets start out with D_2O in them; it's dissociated D_2O and it forms a low level plasma. That means they are separated. They are basically shot out with an electromagnetic field around them. They have free electrons that squeeze the jet to very high densities as it moves to the target foil. Everything I do is moving these jets to a target foil lattice surface. You have to have the right gap between the piezo device and the foil. It has to do with the frequency. That has something to do with a quarter of a wavelength, perhaps a half. This part is where art comes in. We don't know exactly what is going on with this jet. We know it exists; it can be squeezed to much higher densities. It can be implanted into a lattice. It is traveling so fast. The larger entities like argon, which is the gas I use, and oxygen, are big and bulky. The deuterons are very small. They are the same scale as the electrons, which are equally small. These things are so small they can slip into a lattice very easily. It is so interesting to me because there is a big difference between the mass of the electron and the mass of the deuteron on the time scales that I'm looking at. After the implantation, things are basically standing still. You have this big cloud of free electrons and then you have these basically immobile deuterons. The electrons basically, since they have these different charges, surround the almost non-moving deuterons, and in surrounding them the electrons want to get to them but they are so hot they don't interact because they are still a plasma. We are talking about plasmas. We are talking about inertially confined systems.

MM: So what happens? How do you get over that if they don't interact?

RS: What happens is they keep on getting compressed. The electrons are pushing them in. You get to a point where you can get a fusion occurring. There is actually very high-density phenomenon happening, but very fast, in a pico second. The only thing moving is the push of the electrons into the non-moving deuterons. They are corralled together like barking dogs at the sheep. The electrons are like barking dogs trying to get them together.

MM: That's a great metaphor! Bless your heart, Roger, my biggest problem is that many people I interview cannot enunciate their work in a way that other people can understand. This is very user-friendly and comprehensible.

RS: That is why I draw things. It helps me so much in understanding what is going on...I grew up at Berkeley. We were Depression kids and my Dad lost his job because he was an architect and there was no work so we moved into my grandmother's house there. My mother worked in a little dress shop...My father died at a pretty early age when I was 27. My mother became an artist, a professional who made her living from her art. She taught at the Parsons School of Design in New York.

MM: So these different family influences show up in your sensibility and work, this acuity of yours and where it came from. Do you think you were drawn to the field you were in because of this background?

RS: I think along those lines.

MM: We were talking about how you were saying the push of the electrons to the non-moving deuterons had them corralled together like barking dogs…so what happens then?

RS: What happens is there is no interaction between sheep and electrons but they are forced into a tighter and tighter pack. This time period is less than a pico second.

Roger Stringham's coworkers have observed that cavitation cells are technically difficult to operate in a mode that gives reproducible results consistently. Roger Stringham's work gives valuable information about the approach taken, what is involved, and the results to date, as well as providing information and direction for future experimentation. A second article will follow in *Infinite Energy* that will include further details from Roger Stringham's experimental coworkers and an interview Michael Melich and I did with Roger Stringham.

I want to thank Roger Stringham and Julie Wallace for their assistance.

References

1. Stringham. R. 2010. "Cavitation and Fusion," ICCF10 Poster, https://www.lenr-canr.org/acrobat/StringhamRcavitationb.pdf
2. Godes, R. 2015. "The Controlled Electron Capture Reaction Model," https://brillouinenergy.com/newwebsite/wp-content/uploads/2019/04/Brillouin-Energy-Hypothesis-1.pdf
3. Wu, K.J. 2021. "The Extremes a Walrus Will Go to for Love," *The Atlantic*, June 29, www.theatlantic.com/science/archive/2021/06/walrus-sivuqaq-clap/619319/
4. Larsen, N. and Reichmuth, C. 2021. "Walruses Produce Intense Impulse Sounds by Clap-induced Cavitation during Breeding Displays," *Royal Society Open Science*, June 30, https://royalsocietypublishing.org/doi/10.1098/rsos.210197
5. https://en.wikipedia.org/wiki/Jeremiah_Day
6. https://koreanwarlegacy.org/roger-stringham-artwork/ ; https://koreanwarlegacy.org/interviews/roger-s-stringham/
7. https://cdnc.ucr.edu/?a=d&d=DCS19091007.2.23&e=-------en--20--1--txt-txIN--------1
8. Stringham, R. 2015. "T, ^{3}He and ^{4}He Measurements from a Ti Foil Run a LANL in 1994," *Infinite Energy*, 21, 124, 12-16.

Marianne Macy has been doing oral histories relating to cold fusion since 2007. She is writing a book on cold fusion's start to the present day. She reports on new energy, integrative medicine and social/business issues.