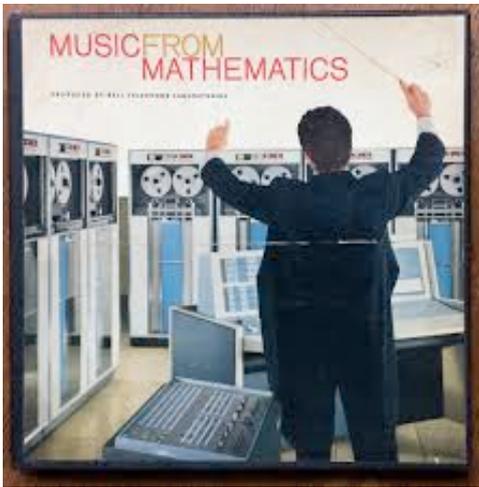


# Memories of Max Mathews

My first memories of Max were in the summer of 1962. As a 9 year old shy and reclusive child I was holding onto a rope for dear life in the bow of his sailboat as we traveled across Long Island Sound. In the stiff breeze, I looked up to him with a sense of awe and wonder. I was already a huge fan of his because in the fall of 1961, my father had brought home a test pressing of "Music From Mathematics", a collection of short pieces made with the first computer music program at Bell Labs. My father was a mathematician at the Labs and was part of the group that created this record. I played the test pressing so many times that I wore it flat. We had to buy the commercial record when it was released the following year to replace the record I had ruined in my youthful enthusiasm. I can remember to this day



*"Music From Mathematics" record*

the impact of hearing those little sound experiments on that record. The following year, I built my own synthesizer to pursue my own set of electronic sounds. I have never stopped building electronic circuits and playing electronic music since that time.

My next time with Max was during the summer of my senior year, July and August of 1971. He hired me to work as a wiring technician in the computer music output room of the GROOVE system. This was the first assemblage of voltage controlled sound modules to be controlled by computer. I was building fixed-tuned resonance circuits based on the exciting revolutionary new



*Max Mathews and his electric violin*

opamp of the time, the u741. Max was designing the first prototype of his electronic violin emulating the timbre of a Stradavarius using these circuits. This was a great place to be. I became fascinated with psycho-acoustics. Jean-Claude Risset, a french composer who later became head of IRCAM at the Centre Pompidou, was in residence that summer and I admired his Music V composition "Little Boy Suite". Risset used Music V to generalize the pitch illusion described in Roger Shepard's

1964 paper, "Circularity In Judgments Of Relative Pitch". Risset programmed a continuous sound that went down and down forever. These later came to be called "Shepard Tones". You can make one yourself; they now can be generated from a VST ([mda-vst.com](http://mda-vst.com)). Max presided over this hotbed of activity and enjoyed the interplay of all of the creative personalities. His electric violin was his pride and joy. Playing with the real time controls of the GROOVE output gave him the idea for what later became his famous Radio Baton.

I spent the next eight years living and working in Honolulu, Hawaii. Starting in 1972, I taught classes in Arp Synthesizers. We at Sinergia Studio were a stocking and demonstrating ARP dealer. I also ran a testing station for the ARPANET, a Department of Defense project that was the first iteration of the internet. The group of engineers I worked for, calling themselves the ALOHA project, helped develop TCP/IP, the protocol used on today's internet.



*Max Mathews and his Radio Baton*

In 1979, Max invited me to come back to the Labs as an "Artist In Residence" after I had sent him my first commercial electronic music synthesizer release, "Electronic Music From The Rainbow Isle". I doubt that Max ever listened to it; his musical ear, like my father's musical ear, was fashioned from tin.



*Bell Labs Digital Synthesizer, 1978*

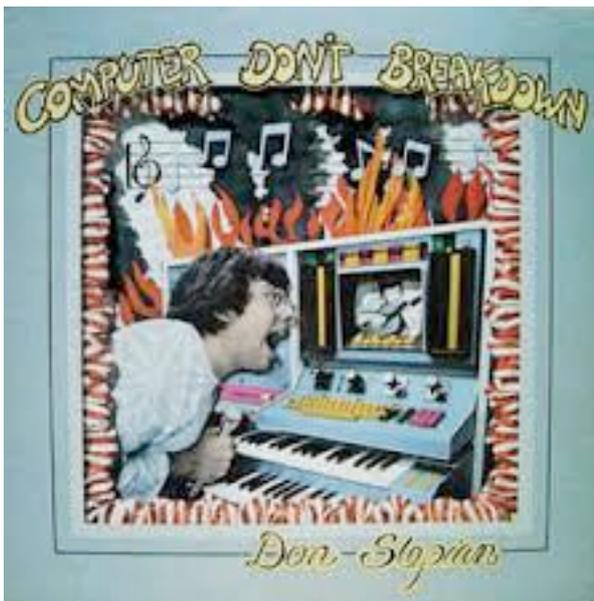
Max needed someone like me for a special situation at the Labs. In 1977, hardware engineer Hal Alles and software engineer Doug Bayer put together a remarkable musical instrument known as the "Alles Machine" that pushed the then known boundaries of digital signal processing and sound generation. They learned what they could and showed the machine around. After two years it became a bit of an embarrassment. It

was obviously a musical instrument and they had spent a fair bit of money on it,

even by the profligate Bell Labs standards of the day. By the summer of '79, they pulled the support plug and moved the machine upstairs from Hal's lab to Max's little cubbyhole computer music lab in room 2D529, nestled in the back corner of the corridor and safely out of sight. Max brought me in to see what could possibly be done with the machine in terms of actual music. Max had a real interest and appreciation of music. He paid me a small weekly stipend (\$117 as I recall), with petty cash vouchers from his secretary and gave me a Resident Visitor's pass to the Labs. I did what I could to be helpful and useful to him and the other scientists in the Acoustics & Behavioral Research department. I recall making soundtracks for several Bell Labs publicity films. For the most part, I simply had free run of his lab and the other facilities at the Labs. Once again it was a great place to be. Wonderful and accomplished musicians, such as Larry Fast, Roger Powell, and Laurie Spiegel, would come by and record pieces on the Alles Machine for their albums. I spent a great afternoon talking with Bob Moog showing him the Alles Machine software implementation.

At that time I had a lucky break. There was a young engineer, Greg Sims, who worked in Hal's lab and was about my age. Starting in 1976, I had become fascinated with aleatoric music composition techniques and started playing with sequential permutations using the EML 400/401 analog sequencer. I bent Greg Sim's ear all about this. He was kind enough and interested enough to program a three-stage sequential permutation algorithm using three of the bottom

programmable sliders on the Alles Machine. I was in absolute heaven! The Alles Machine had a big digital event sequencer, which was really an array in the LSI-11's computer memory. I would input 40 or 50 notes into the digital synthesizer using the root, flat 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, and flat 7<sup>th</sup> scale degrees. As I would raise the first permutation slider, the sequencer would skip a note and then play a note. Naturally, playing every other note would generate a new melody from my note list. The slider went from 1 to 7. As I raised the slider further to the 5<sup>th</sup> degree it would play a note, skip five notes and then play the next note. You might think that this scheme would only yield 7 different melodies but that's not



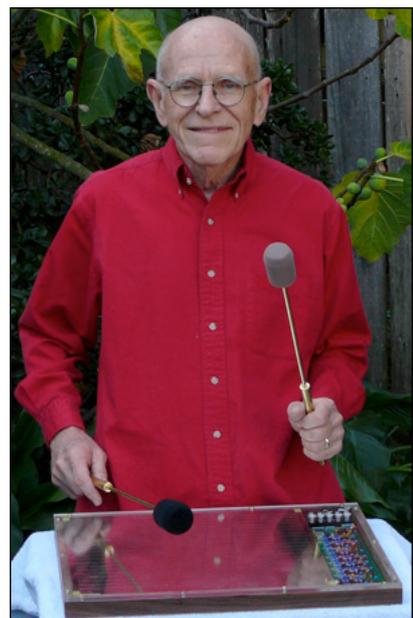
*"Alles Machine" music record, 1980*

true. Since the sequence was playing in real time, the results depended on exact

time when you touched one of the sliders to start the permutation. Now add two more sliders that did the same thing. I could play a note, skip 3, play a note, skip 7, play a note, and then skip 5. With a well-constructed note list I could permute my sequence all afternoon and not repeat myself. In addition, I could retrograde, transpose, play in dotted rhythms or play in half or double time. I put this all to good use in my first full length piece on the Alles Machine, "Sea Of Bliss", released in February 1980 on cassette. I made a 16 minute version of Sea Of Bliss, called "Sonic Perfume", that would fit on the side of a record. I made a lot more music in Max's computer music lab, both with the Alles Machine and Music V, and released some but not all of it on my first long playing vinyl record, "Computer Don't Breakdown". The cover is a psychedelic impression of the Alles Machine. Above is the cover of that 1980 record in all of it's awful glory!

Greg Sims, my engineer friend, discovered that he had a congenital tumor in his stomach. It was already untreatable when it was discovered. He had to leave the Labs and to my enduring sorrow he died a few short months later. At that time I discovered something about Max that I've found to be true with many engineers. Max was not comfortable talking about emotions or feelings. He had feelings but they just were not part of his vocabulary. Science, engineering, and machines were things he understood. People were far more difficult.

The Alles Machine finally fell into ruin in the Spring of '82. I left the Labs. I remember an evening at Max's home a few years later. Jean-Claude Risset was back in town and Max had gathered a bunch of computer musicians for an evening soiree. His wife Majorie boiled hotdogs which we cut up into small pieces and ate with toothpicks. My parents were there since they were friends with the Mathews. Jean-Claude went around to each person with unfailing courtesy and charm and asked each one about his or her "work", which meant their work in computer music. I remember watching and hearing the intense prideful competition. Each person tried to make themselves and their work seem as important as possible. I didn't say a word. I never thought my work or my passionate interests had much significance. In a world filled with pain and sorrow it seems like a highly elitist affectation, something to keep quiet about. I could not bother a disinterested world with such obscure concerns. Max, as usual, was utterly oblivious to this. He was now focused on real-time



*Max Mathews' happiness*

control of complex musical processes. Since I was always a live performer, I thought this was great. We had a good talk and I could really relate to his current interests.

It was about 10 years later, in the fall of 1993, that I saw Max for the last time. He was now retired from the Labs and a music professor at CCRMA, part of the music department at Stanford University. I was playing my current keyboard instrument on tour with my musical group "Electric Diamond", with Stuart Diamond on Lyricon and Karen Bentley on violin. Max allowed me to arrange a concert at CCRMA. We had a grand space with four huge loudspeakers. We played our synthesizer version of "Pictures At An Exhibition" along with some improvs. Max looked noticeably older but it was like we had never parted company. He seemed happier than he was at the Labs because he didn't have to manage people. He could play with his machines in the company of many very bright people who knew him and understood his passions. I modified an Ensoniq Mirage sampler for Richard Boulanger which he used with Max's Radio Baton. Max could really see where things were going and he was glad to still be a part of it all.

I wish Max could have seen today's graphic tablets. He would have loved the amazing musical instruments that now use all the position and motion sensors of the tablet, creating exceptional musical effects. From age 7 to the present day, Max's work, instruments, patronage, and encouragement have shaped my life in music. I am truly grateful to have known him.

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Chongqing, China  
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