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# The Historical Sounds of the VauxFlores Sound System – a personal narrative on finding inspiration through scarcity in my early synthesizer building experiences while living in rural Colorado and Central America.

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**Abstract:** I began my tenure as a synth builder in the remote wilderness of Colorado, salvaging components from wherever I could and finding suitable substitutions whenever I was able to make the 60 mile trek to the nearest hardware store that had a rudimentary electronics section gathering dust in the corner. All said, I'm still amazed that I was able to build what I did given these limitations. Years later, while still building, I found myself living in Costa Rica with a new set of geographic-specific limitations influencing my designs. For this session, I would like to discuss my experiences as a builder on the frontier, finding inspiration through scarcity and showcase the instruments that were ultimately derived from these locales, beginning in the mountains and ending with the creation of what was possibly the first modular synthesizer designed and built entirely using components native to Central America.

**Keywords:** diy electronics, off-grid living, Latin America, globalization, narrative, circuit-design

In the fall of 2007, while finishing my thesis, I came to the conclusion that I would be unable to sustain myself if I continued living in the San Francisco Bay Area and took a job as an off-grid solar electrician in Gunnison, Colorado. My rationale for this decision stemmed from the fact that this was at the height of the gas bubble and alternative energy was a booming market – all I'd have to do was live cheaply, work hard and write by the campfire for a few months and I'd be able to return well-off, defend my thesis and have a few romantic tales to tell about my time in the wilderness. Unfortunately, as romantic as that idea sounded, it didn't quite work out that way.

For my accommodations, I was the guest of my uncle, a survivalist who lived approximately 30 miles outside of town. At the time of my arrival, he had been living off-grid for two decades and was currently living in an earthship alongside his family, but not necessarily with enough room me as well. So I was offered his previous dwelling before the earthship – a yurt.

As far as yurts came, this was luxurious – or least had furniture, flooring and a fireplace. Lighting came by way of oil lamps, but a solar panel wired to a car battery was able to collect enough power to allow one full laptop charge per day to continue writing, and by extension, living an off-grid bohemian lifestyle. There was even a moment when I considered staying in the mountains, enamored with the thought of being a rural eccentric. And so it went for the first six weeks, punctuated by a trip to Oakland to meet with faculty, perform, record and lay the groundwork for post-graduate life. When I returned a week later, a blanket of snow awaited me and much of the solar business had frozen over. My first draft had been submitted and given that there was no work, little money, ample time and a January tour booked, I needed something to keep me occupied. I decided to build a synthesizer.

A few quick tips for those looking to dive into synthesizer design while living off-grid in cold climates. First, a soldering iron should never be considered as a heat source. Extreme cold reduces manual dexterity and while having a heated instrument in your hands may provide some respite from the cold, you're still more likely to burn yourself if the rest of your environ is below freezing.

Second, be patient and resourceful. Know what components can be substituted, modified or eliminated. In my case, the only store with a selection of electronic components was a hardware store that specialized in ranching supplies located 60 miles from my campsite. I was able to find the basics – assorted resistors, capacitors and generic transistors, but after an exhaustive search, realized that a design using anything beyond the most basic of integrated circuits would be out of the question. Electrolytic capacitors were also an issue, though I was able to salvage some from impulse aisle electronic devices as well as from toys and other discarded electronics.

Ordering components proved challenging since I lacked a physical address and delivery services refused to deliver off-grid due to uncertain road conditions. It was possible to include a note such as “please leave at third cattle-guard at end of pavement” in an order's delivery instructions, but I wasn't comfortable leaving a package of electronic components exposed to the elements – especially when going to check to see if it arrived was a 30-mile trek. Not to mention that I simply did not have enough money for anything outside of basic survival, let alone mail-order.

Finally, while it's not always possible to do this while living, designing and building off-grid, it helps to be connected. While I lacked an Internet connection and cellular signal at my campsite, I would bring my laptop to town when I needed wifi for research or correspondence. This was prior to the DIY/maker boom, so suggestions on de-bugging home-built synthesizers were limited, but I made due. Even without forums, guides and wiki's, having access to data sheets can be highly beneficial. If not for the web, there was also the local library, which, like the hardware store, had a distinct emphasis on western culture, did contain books on basic electronics.

Given my location and lack of resources, I decided to base my instrument off Peter Blasser's Rollz 5 circuits. I attended college with Peter and first encountered his instruments attending his senior recital. As a musician who was introduced to electronic music by way of the rave scene of the 1990's, I was believed at the time that the secret to a successful career in electronic music was to assemble a studio of high-end, coveted, vintage analog equipment. Seeing Peter's instruments came as a revelation that there were other paths in electronic music outside of consumer acquisition. During my first year of graduate studies, Peter released his series of “paper circuits,” designed to be assembled on perforated card stock. Considering my lack of resources and the thought that if I got really stuck, I could email Peter for advice, I decided that this would be the best outlet for me. Even more so due to the modular design of the Rollz circuitry – if it seemed impossible to find a particular component, I could always skip that section of the instrument and concentrate on a part that I was able to assemble, returning to the more obscure sections when time and availability permitted.

To begin, even finding a suitable amount of card stock was difficult. There weren't any art supply or framing shops in the region and the survivalist lifestyle reduces one's interaction with packaged goods. While packaged commodities were rare, building materials were abundant and I was able to use a discarded piece of plexiglass weatherproofing as the base of my circuit board.

Finding the necessary resistors was easy. Even in an electronics department geared toward ranchers you're apt to find a variety pack of 100 or so resistors. These will be sorted into common values, but provided you know the basics of resistance in series and parallel, you can combine resistors to come up with something that is close to your desired value. The same can be done for capacitance, though in this case, matching capacitors wasn't an issue due to the open design of the Rollz circuitry. Finding equivalent transistors proved the most challenging. Peter's circuitry calls for BC547 transistors, which are oriented as emitter-base-collector, and the only available transistors were 2n3904's, which are oriented in reverse, which I only discovered through trial and error. After six weeks of scavenging, substituting and experimenting, I had a primitive, yet formidable bank of oscillators that oscillated, and that's about it. However, for someone attempting to build their first instrument in adverse conditions, this was an accomplishment – or at least enough of an accomplishment to inspire me to continue pressing on, which in this case meant attempting to build a filter section.

Ultimately, I failed to do this during my time in Colorado, due to my lack of knowledge, resources and insistence in following instructions. I gave it an honest effort, but lacking access to even the most basic CMOS IC's, I was unable to assemble anything close to an approximation of the filters used in Peter’s design. Not to say that it couldn't be done. A simple low-pass filter can be assembled with as little as three components – a fact I was unaware of at the time. In hindsight, there are a lot of things I would have done differently, but considering that my thesis defense was approaching and I would soon be in Oakland with an address and income, the thought was to put this project on hold, work with the circuit I had assembled and expand when I was able – one of the benefits of building a modular instrument.

I left Colorado in December after a blizzard had deposited over three feet of snow on the region. Under most circumstances, the average person would opt to wait until things melted and the roads were plowed, but neither seemed like they would be happening for several days – and my thesis defense was in less than a week. After

some hesitation, I decided that the only way to make it back to civilization was to walk. In my pack, along with the essentials for a 30-mile walk through waist-to-chest deep snow was the circuit – at that time simply wired to a 1/4" output jack to allow for demonstrations in California of how I'd spent my time in the mountains. Sparing the details, I survived the walk, caught a train back to California and successfully defended my thesis. A week after that, I arrived in Costa Rica for the holidays and decided to finish the circuit I'd started in Colorado.

Building in Costa Rica offers it's own set of challenges. However, a quick fact that most are unaware of – the largest export of Costa Rica is semiconductors and access to components is plentiful and inexpensive, provided the component is manufactured in the region. If it isn't, it might as well not exist. Also, while Costa Rica does have a reliable postal service, it also has high import tariffs, especially for industrial materials. With little effort, I was able to find the missing CMOS IC's and completed the circuit, which, in spite of the substitutions, modifications and alterations made out of necessity during my time in the mountains, worked in it's entirety, provided you overlooked the fact that it existed as a series of components woven together and held in place by a piece of plexiglass that used to be a window.

Finding an enclosure in Costa Rica was the most difficult challenge I encountered. After checking several stores, we discovered that aluminum and plastic enclosures were not manufactured locally and therefore were not stocked due to the markup that would be required to turn a profit. I found several decorative souvenir boxes made from tropical hardwoods that would have worked, but considering that a combination of industriousness and paucity were the inspiration for building an instrument in the first place, I couldn't necessitate spending close to $100 on an enclosure.

In the end, the enclosure was assembled from another discarded plexiglass storm window. At the suggestion of my wife's brother we made a case by heating the plastic with a heat gun and bending it around a table. Enclosure complete, it was now only a matter of mounting the circuit into the case. Borrowing from Peter's aesthetic, as well as the fact that 1/8" jacks are impossible to find in Costa Rica, we used machine screws for the interface, as well as two potentiometers and a ¼" jack for the output. After preliminary testing, I brought the instrument to a Max/MSP workshop I was teaching in San José, excitedly comparing my efforts to that of early electronic music pioneers. The response was tepid. Among the comments when I presented it to the group were "But how do you a play note on it? How do you tune it? and "Where do you plug in the keyboard?"

I'd like to think that this was in some degree one of the first modular synthesizers constructed in Costa Rica, and possibly even Central America. Six years later, in 2013, modular and analog synthesis were still rare in Costa Rica when I lead a workshop called TicoTronics, which focused on the design and construction of a modular synthesizer using only components common to or constructed in Costa Rica. The instrument was simple, consisting of two voltage controlled oscillators, a sequencer and a mixer – but the fact that there was interest at all in such a workshop was a statement of gradual acceptance of an indigenous electronics culture within the larger scheme of experimental music in Central America.

It should be noted that this paper is by and large a historical document with regard to design, as well as how this individual experience reflects on the degrees in which technology, society and culture has changed in less than a decade. In the case of Colorado, the global recession devastated the local economy shortly after I left my encampment. If I started this project six months after I did, the resultant instrument would have been completely different, due to the lack of locally available components and the inability of building an instrument from the ground up without the loss of regional identity as requisite parts are ordered at convenience.

In Costa Rica, import tariffs are still in place, as is the continued reliance on local components with two exceptions. First, in 2014, several semiconductor manufacturers operating in Costa Rica closed their plants in favor of cheaper markets elsewhere. The electronic supply stores in San José are still open, but it's only a matter of time until prices increase to offset the cost of imported components. Secondly, due to the emergence of clandestine shipping companies that allow for the importation of goods without tariffs, there has been an increase in the number of design and fabrication tools such as CNC mills and laser cutters available for individual use. This in turn has lead to the rise of a small group of designers who are beginning to assemble their own unique instruments housed in custom-milled enclosures.

Another aspect contributing to the historical nature of this paper is an acknowledgment of the role that the Internet played in both locations. Even in Colorado where access was restricted, answers were a click away. While I am grateful that open-source code repositories, schematic libraries and affordable small-scale industrial services are available to designers, I sometimes feel that it's becoming too easy to become a builder – and that certain designs and techniques are becoming homogenized as a result, often at the expense of regional identity. I'm envious of electronic music pioneers in that their designs were developed prior to the Internet and are unique to their respective institutions, available components and regions in which they were conceived. While one of the concerns of this paper is with regional identity in the design of electronic music instruments, one could argue that even in my remoteness, I was still building to a global aesthetic in that the internet was the source of my designs, as well as the solutions to the problems I encountered while building them.

With that, two thoughts emerge. The first concerns the multilateral concept of community within electronic music and electronic instrument design. For instance, I used information that is available to a global community of artists and engineers to create a device that in turn influenced the aesthetics of a local subset of the same community. For the sake of argument, let's say that another artist used the same information to create a similar instrument somewhere else that in turn influenced their respective local subset. Even given these parallel occurrences, the likelihood that each community could produce something aesthetically and culturally distinct in spite of their technological similarities is high, given that it takes more than a preferred compositional technique or piece of technology to define the sound of a region. In that light, I'd like to think that in the case of my time in Costa Rica, I was contributing something regionally unique regardless of the global roots of my circuitry's design. The same cannot be said for Colorado due to the fact that there were no other humans living within two miles of my encampment.

Finally, with regard to globalization and the potential loss of regional identity in the aesthetics of electronic music instrument design and the potential homogenization of compositional and design aesthetics, I have to question whether or not this is actually a bad thing. The history of electronic music instruments contains several parallel developments, for instance, the “west-coast” low pass gate compared with the “east-coast” ladder filter – as well as other examples unique to oscillators, amplifiers, envelope generators, and so on where a unique design is developed to serve a similar function. As these designs become codified, archived and distributed digitally, hybridization has occurred, leading to the standardization of new designs as the assimilation of ideas and techniques combine the best aspects of several designs; moving forward the global community as a whole in hopes that positive feedback from regional communities will in turn feed the development of new instruments designed in response to the needs of a particular community, whether it be a maker in Central America, an engineer in San Francisco, or in my case, a displaced artist living in a tent, looking for something to do to keep his hands warm.

**Bibliography:**


- Blasser, Peter. "ROLLZ-5 Drum Machine." *Rollz-5*. Ciat-lonbarde.net, 2007 Web.
- Brewster, Richard. "Rollz-5 Schematics." *Richard Brewster's Synthesizer*. Pugix.com, 2014. Web.
- Horn, Delton T. *Music Synthesizers: A Manual of Design and Construction*. S.l.: Tab, 1984. Print.
- Horn, Delton T. *Oscillators Simplified, with 61 Projects*. Blue Ridge Summit, PA: Tab, 1987. Print.
- Horowitz, Paul, and Winfield Hill. *The Art of Electronics*. Cambridge: Cambridge UP, 1989. Print.
- Randewich, Noel. "Intel Closes Costa Rica Operation, Cuts 1,500 Jobs." *Reuters*. Thomson Reuters, 08 Apr. 2014. Web. 05 Sept. 2016.
- Villaperros, Joan. "La Jauría - Fábrica De Juguetes Sonoros." *La Jauría - Fábrica De Juguetes Sonoros*. Http://jugueteslajauria.blogspot.com/, 2016. Web.