

# A Life in the Day

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## Sunday Night

It's twenty minutes to midnight and I've got a newsletter to write. This weekend, and the whole week to be honest, pretty much got away from me — I felt overwhelmed at times by the number of things I had to do, but also managed to have a little bit of fun. It usually takes me a few hours to write one of these newsletters. I don't really have a few hours tonight so I'm going to try to be brief.

Pippin had online choir camp every day from last Monday through last Friday. It went quite well. The choir instructor was working with a group via Zoom. I'm not sure how many kids were on the call. It may have been a dozen. It must have been like herding cats for her — very difficult to keep all the kids as focused as possible for that hour. But she did a great job, employing all kinds of teaching strategies, including taking several breaks during the hour to have everyone move and stretch. The technical limitations of Zoom make it impossible for everyone to actually sing together and hear each other simultaneously, and so over the course of the week she planned and executed a project to have each child record the same song at home, singing along with the same backing track. The kids all sent in photos and artwork to include.

This all worked, and our choir instructor mixed a very sweet video with all the kids singing together.

For my part, this forced me to scramble to get some new studio gear set up. When I started to work from home again, I had to tear down the setup I was using in April and May to record songs, because I needed that desk for my work laptop. I also needed to set up my personal laptop, that I'd been using for music, for the Zoom calls. (The HP laptops running Linux might be able to handle the external Rode microphone, and so might work for Zoom calls despite the problem with lack of driver support for the built-in microphone, but I had not yet tested that, and deemed it less risky to just use my laptop, which is running the latest Windows 10 updates).

I've had ongoing problems recording audio and even just playing audio with my old Mac Pro. It doesn't seem to matter what audio interface I use — I've

tried three. The problem seems to be a software problem, some combination of the operating system and drivers, resulting in glitchy audio. And I've had compatibility troubles using my old audio interfaces with Windows 10, including the problem where the operating system keeps powering down the devices despite my best efforts to configure it so that it won't do that. It seems that both Apple and Microsoft aren't doing a great job maintaining backward compatibility with older audio interfaces. I strongly resist the notion that I should have to discard and replace working hardware to keep up with software changes, and I've long been wanting to try more hardware-based recording setups. So this summer, I've been starting to distance myself from relying on computers for recording audio. So, I've been feeding microphones and instruments into the SSL SiX mixer, and now I'm recording to a Sound Devices MixPre-6 II.

Of course, the MixPre *is* a computer. But it's not a *general-purpose* computer, it doesn't connect to the Internet, and the vendor doesn't release a never-ending stream of software updates, in the name of improving security, that also try ever-harder to convince me that the computer I paid for is just a vehicle for subscribing to an operating system and applications, and force me to pay them to use their servers in order to do the same kinds of writing, editing, recording, mixing, and publishing that I've always done. It's an appliance. I'm not ready to chisel the inscription on the headstone of the grave of the general-purpose computer just yet, but I think there's no denying that Steve Jobs' vision of the general-purpose computer as a "media hub" has been neglected and vandalized in recent years. But that's a longer rant for another time.

## The MixPre 6 II

The MixPre is a small device — almost comically small. Just as the SSL SiX is a scaled-down, "prosumer" version of the much more expensive SSL mixing consoles, the MixPre 6 is a "prosumer" version of their line of professional field recorders for video producers, which cost several times more. When I was considering this device, I also considered buying a rack-mount digital recorder from TASCAM, the DA-3000. My friend Rich has one of these and uses it to record podcasts and live shows, but ultimately I decided that I wanted to try something more portable and more flexible.

Like the SSL mixer, this device provides startlingly good sound quality. It has some features that are exactly what I wanted, as well as a few I might experiment with, and a few I will likely never use. The basics: it will record very high quality audio from several inputs simultaneously to an SD memory card, and also back up the file to any USB flash drive. That is an incredibly useful feature. I can leave the SD card in it, and when I'm done recording something, turn the unit off, pull out the flash drive, and stick it in a computer. The files I just recorded are right there, and I can start editing or uploading or mixing them.

You can plug it into a computer using USB, and configure it to operate in one of two modes. In one mode, it acts as an external hard drive, giving you direct

access to all the files it has recorded on the SD card. Most digital recorders including my hand-held Olympus LS-10 recorders work like this. I haven't tried this yet, but I assume it works fine.

In the other mode, it acts as a USB audio interface, and it has a special twist — a feature I've long since would be a good idea, but never seen any other vendor actually include. The hardware inputs and outputs can be freely re-mapped to the four USB channels (comprising an input stereo pair and an output stereo pair). I've wanted this feature so badly that I considered designing and building my own audio interface and writing the firmware so that I could get access to this feature. I have long known from my work writing code for various digital signal processors that this kind of thing can be done; it isn't even that hard. In fact, I wrote all the code to route and mix audio in a product that interconnected incompatible radio systems used by different first responders. But I haven't seen it anywhere else in an audio interface.

This routing flexibility will be a godsend, allowing me to make up for inflexible software such as Skype, which only will receive and send audio on the first channel of whatever audio interface it is set to use — which is often not what I want it to do. And it also opens up interesting possibilities for live-streaming.

If you have never tried to record a podcast with a remote guest, this explanation will probably not make a lot of sense, but this “virtualization” of the USB interface channels makes it incredibly easy to configure a “mix minus” — a separate feed that goes to the remote guest, and which contains the audio the local host and any local guests are listening to in their headphones, *minus* the audio from the remote guest — to avoid feedback and echo. Essentially, it allows an audio interface to be flexibly reconfigured in the same way that a good hardware mixer can be reconfigured.

Can't I already create this “mix minus” with the SSL mixer? Yes, I can, but this gives me more options. For example, I can use a computer with its own audio interface for the remote audio, and make the local and remote mixers in the SSL mixer, but then also use the MixPre with a second computer to stream the recording session live to a streaming service such as Facebook, possibly along with video, while at the same time recording everything on the MixPre, instead of the computer.

Previously I've tried to do this kind of somewhat complicated setup almost entirely “in the box,” inside the computer, using elaborate hacks and software configurations. I've combined multiple audio interfaces using MacOS X's “aggregate device” feature. I've used both Apple Logic and Mainstage running on the same computer simultaneously to give me different processing options. I've run fiber optic cables to carry S/PDIF audio output from one interface back into the Mac Pro's built-in S/PDIF audio input. And I've tried a variety of different software hacks that work with “virtual” mix buses, initially working with a long-since-broken and abandoned program called Soundflower, while the most recent one is an open source program called Jack. None of these setups

have been reliable, and have always been incredibly fragile, requiring extensive and careful setup work each time I want to use them, and breaking whenever any of the software involved is updated.

I'm happy to be able to leave some of that behind, but still wondering what took so long.

The MixPre has another interesting feature — it can be set to record audio data using a floating-point format.

It's not so easy to explain why this might be useful, but the short form is that it can be useful for recording audio that may cover a huge dynamic range from loud to soft. Imagine making a field recording of mosquitoes buzzing; you turn the preamplifier gain up high to capture that quiet sound. But then, a thunderstorm blows through. Our hearing operates logarithmically — the same ears that can pick up the incredibly quiet sound of a mosquito can also handle the sound of thunder without breaking (well, usually). But analog to digital converters don't operate logarithmically like our ears do, and neither do the usual 16-bit or 24-bit integers that we use to encode digital audio.

So there are actually two innovations that make this possible. The first one is that each input channel on the MixPre uses two analog to digital converters simultaneously, scaled to different voltage ranges. The system can automatically switch from one to the other in order to handle a huge contiguous voltage range — representing something like 140 dB. The second innovation is the use of floating-point numbers to record the audio samples.

Sound Devices didn't invent either of these techniques, and I'm not sure they are even the first vendor to put them together in a product. One should be skeptical of hype about any new technology like this. But it's intriguing — the net effect is that when recording using the floating-point format, the recorder can cover an enormous volume range without clipping, where rendering the same signal to a 16-bit or 24-bit fixed-point format would *either* result in digital clipping at the high end of the volume range, or loss of audible information at the low end, depending on whether the gain was set too high or too low for the actual sounds recorded.

This feature is still a bit cutting-edge, in that a lot of software doesn't support floating-point audio data at all, or doesn't support it very well. And under controlled conditions it would generally not be necessary, as I can set the gain to the expected range and avoid audio that is either too quiet to get a useful signal, or loud enough to cause digital clipping. But I'm interested in field recording, and I'm fascinated by the prospect of being able to make recordings that are only limited by the physical and electrical limitations of the microphones and converters I'm using, not by the sample bit depth. There are still limitations, but this effectively moves the "bottleneck" elsewhere, and the bottleneck of the microphone and converter limits is much wider than the bottleneck of the 16-bit, or even 24-bit, integer format.

The feature is somewhat analagous to the use of “raw” audio from digital cameras, although it’s an imperfect analogy. It makes the *encoding* of the digital audio work more like our ears do, and like microphones do, and like signals in analog audio circuits do — they work across a huge range of values that, because the range is so huge, are better expressed using a logarithmic scale than a linear scale. Floating-point numbers in computers don’t really follow a base ten logarithmic range the way decibel values do, but they do encode a separate exponent and significand, so can render value that are close enough for pretty much any current practical application.

If you’re interested, here’s a video that describes this floating-point audio feature.

And if you’re wondering, yes, logarithmic number systems exist and have been implemented in computer systems just as floating-point number systems have, although they have never been widely adopted.

I mentioned that there were other features of the MixPre that I was unlikely to actually use. There’s a special “musician’s mode,” which can be unlocked at additional cost. This feature turns the MixPre into a tiny digital audio workstation, a bit like an old multi-track cassette recorder, allowing the user to record and bounce and mix tracks in ways that are similar to programs like Audacity and Logic and Garage Band. Everything is controlled via the knobs and buttons and the tiny touch screen. However, my eyes and fingers have reached the point where I no longer have any interest in doing complicated operations on a device with a tiny screen, just because it is possible. So I’m not planning to unlock and use this feature.

There are some downsides to the MixPre. It supports a number of different options for power, like its more expensive siblings. But it also winds up introducing a number of compromises in the interest of modernizing certain features and reducing the cost and size of the device itself.

The flexibility is great — it can run on AA batteries, or rechargeable lithium ion batteries, or various kinds of DC power across a range of voltages. So it is designed to put in a bag and use for field recording. It can also be powered by a computer it is connected to, via a USB cable, or by the included AC adapter.

But the USB connection to a computer is done using USB C, and only very recently-designed computers fully support USB C. And the included AC adapter just plugs into the same single USB C port. I think they chose USB C because the MixPre requires more current than the older USB ports can provide.

If you want to connect it to an older computer, you have to use a Y-shaped cable that draws power from two USB ports — either two of the ports built in to your computer, or two ports on a powered USB hub. And since the included AC adapter also plugs into the MixPre’s USB C port, you can’t plug it into a computer using a straightforward USB A to C cable and also power it with the supplied adapter.

There are some other options but they require additional hardware. I think it is

probably possible to power the device using an AC power adapter that sends twelve volts to a Hirose connector, but that adapter is another hundred bucks, and plugging it into the MixPre requires a power sled part with a Hirose socket, which also costs another hundred bucks. So, it seems that there is a certain amount of nickle-and-diming going on, except that the “nickle” items cost fifty dollars and the “dime” items cost a hundred dollars.

I haven’t experimented with this by plugging the MixPre into any of my computers’ USB ports yet, but I’ll try that at some point. Then maybe I’ll be in a better position to understand the power options and the design compromises they represent, and decide what I think of all that.

Anyway.

After a lot of scrambling to get everything set up in my little office/studio room, I had Pippin sing through a Heil PR-40 microphones — not the best microphone for singing, but good enough and I was in a hurry — through a Cloud Lifter, into the SSL mixer channel, with the channel compressor and the bus compressor active. The main stereo outputs of the mixer went into the MixPre.

But I also wanted Pippin to be able to hear his voice with reverb on it, and the backing track. And I wanted to be able to hear the same mix on headphones, too. So this forced me to quickly get a number of things set up and working, including my headphone amplifier, which can drive multiple sets of headphones simultaneously, the effects processor, and also a Radial line driver box that allowed me to plug my phone into the mixer, so that I could route the backing track to the headphones along with the reverb, while sending only Pippin’s voice to the recorder.

It worked like a charm. So, really, I’m very pleased with the device so far. I was very happy to be able to mix and record live sound without using a computer to do anything other than upload the file to Pippin’s choir instructor.

This also gets me most of the way to being ready to record podcasts again, but without using a computer. So I hope to record new podcast episodes soon, and also have an easier-to-manage workflow for bringing in remote guests.

## **Time and the ’Rona**

Several of my friends have spoken to me about the warping of their sense of time that has been occurring during the present crisis. Days drag, and hours go by in a flash. Well, it keeps happening to me, too. I thought I had enough time this evening to write an overview of the week. But it’s now almost 3 a.m. and only just now have the babies become quiet enough to allow me to think clearly. And all I’ve managed to do is to write about a new piece of audio gear.

I guess I’m become a bit like the late Jerry Pournelle; this is sort of my version of the “Chaos Manner” column he used to write for BYTE magazine, back in the day, which I always read each month.

There was so much more I wanted to write about.

But that will have to do for tonight. I've got work again in the morning, and Veronica and Joshua have online choir camp this week.

Have a great week, and stay as safe as you can!

## About This Newsletter

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