Electronic music then and now.

Our usual reminder here that the Resource Bin is now a two-way column. You can get tech help, consultant referrals and off-the-wall networking on nearly any electronic, tinaja questing, personal publishing, money machine, or computer topic by calling me at (520) 428-4073 weekdays 8-5 Mountain Standard Time.

US callers only, please.

I'm now in the process of setting up my new Guru's Lair web site you will find at (where else?) www.tinaja.com This is the place you go for instant tech answers. Among the many files in our library, you will find complete reprint sets for all of the Resource Bin and other columns. Plus a brand new Synergetics Consultant's Newtwork & lots of links to unique web sites.

You will get the best results if you have both Netscape Gold and Acrobat Reader 3.0 installed. This new reader does utterly amazing things online.

Electronic Music

Electronic music is a rather highly technology driven field. Defined by what was possible at the time.

Several goals do include: Producing sounds that are not restricted to the physics of acoustic resonance.

Reducing costs of orchestral, video, theater, CD and motion picture sound production. Adding sound and music to computers. Enhancing a traditional instrument. Creating new sounds.

The earliest electronic music device was an instrument called a Theremin. This dates from the late 1920's. There were two radio frequency oscillators, each connected to sensitive antennas.

Bring your hand near one antenna to change the pitch. The other varies loudness. Playing in mid air.

Traditional Theremin sources often do advertise in Sound Practices. PAIA Electronics has new Theremin kits.

Next came electronic organs. They usually started off with a Top Octave Generator which produced the twelve notes of the highest octave. Cascaded binary divider chains then produced lower frequency sawtooth waves.

A sawtooth wave has all harmonics present and rather strong. Suitable filters could emphasize or reduce any given harmonic to voice the various organ pipes or instruments.

The rule was to use sinewaves for flutes, square waves for woodwinds, and sawtooths for strings.

The "locked in" nature of the notes and the limited note envelopes very much defined the obtainable sounds. The best early book on these was the classic Electronic Music Instruments. Authored by Richard Dorf.

A source for replacement parts and organ electronics is Fistell's.

By far the finest of all the electronic organs was (and remains) Allen. Who went so far as to produce a separate oscillator for every note, simulated air supply variations known as electronic whind, and even a chiff, that sudden startup transient when a traditional organ pipe gets hit with a burst of air. An outstanding read on this is Trials and Triumphs of an Organ Builder from Allen's Vox Humana Press.

Moog and Company

Next in line was the era of the Moog Synthesizer. Using analog VCO voltage controlled oscillators, VCA amplifiers, and VCF filters. VCO's set your pitch, driven from a keyboard voltage.

Those VCA's set the attack-sustain-decay envelope of the note. The VCF's created the note's timbre.

All VCO's had to be stable and have a wide log range. Major problems did include stability and the restriction to monophonic single notes.

One supplier for traditional analog SSM synth chips is PMI.

The next electronic music milestone got reached when this person by the name of Chowning made an amazing discovery. By frequency modulating a note, different harmonics result.

All this happens because of certain obscure properties of all those Bessel Functions underlying FM modulation. You could now create different tonal colors without needing either fixed or tracking filters. On the fly.

Round about the same time, others decided to work out from the supply side. Designing all sorts of personal computer software products. Which let you compose, translate, and print musical scores. The Sonata font from Adobe Systems was one example.

Along with MIDI links between pc's and intelligent instruments.

As with all other electronics, the switch to digital became inevitable. Digital once and for all solved the old polyphony problems. Because your keyboard was now isolated from the tone generators. A pressed key gets a generator assigned. That assignment continued until the note's decay.

Also new to digital was the concept of wavetable synthesis. Where the note harmonics and its envelope could be stored and executed separately.

Wavetable synthesis also drew no distinction between traditional tones, speech, or even oinking pigs. It was a totally generalist solution to creating variable pitch and amplitude.

The early leader here was Ensoniq. Whose chips went into nearly all of the mainstream synthesizers. Not to mention such computers as the Apple IIGS and many others.

Ensoniq never seemed too excited about selling individual chips. Since that time, Integrated Circuit Systems has become a leading supplier of low
cost digital synthesizer chips.

Yet another source of digital synth chips is Yamaha. A fourth significant resource here is Crystal Semiconductor, the foremost supplier of high quality delta-sigma A/D converter chips.

Competing with Crystal are Analog Devices and Burr-Brown.

About this time, the toy music all of a sudden started sounding real good. Letting certain $39 consumer products outperform $8000 electronic organs.

These days, we’re in the midst of a Digital Signal Processor revolution. In which the entire sound gen system is totally flexible, fully programmable and software driven.

**MIDI**

The centermost key to *everything* even remotely electronic musical is called MIDI. MIDI is an asynchronous 31.5 kilobaud channel remarkably similar to plain old serial computer comm. The main two differences are the strange baud rate and the ability for several *addressible* sites to share the same serial channel.

MIDI commands typically specify a note, its envelope, and its duration. MIDI also can get used to upload or download presets. Or anywhere else you’ll want to exchange intelligence between music modules, instruments, or even entire orchestras.

There’s a dozen good MIDI books out. The oldest and finest is Craig Anderton’s *MIDI For Musicians*. The Internet primary MIDI home page is [http://www.eep.ele.tue.nl/midi/index.htm](http://www.eep.ele.tue.nl/midi/index.htm)

*Roland* offers a free newsletter on their MIDI products. Also see the 88 page *Computers & Music* catalog.

**Electronic Musician**

The most obvious mainstream pub is, of course, *Electronic Musician*. A monthly mag chock full of reviews, theory, and commercial ads.

A recent issue covered such topics as multimedia careers, the review of online commercial services, and hot new DSP plug ins.

**MIX Bookshelf**

Electronic Musician also publishes MIX magazine for sound recording studios. Together, they also offer the *MIX Bookshelf*. Which now stocks the definitive collection of pretty much everything on electronic music, MIDI, audio, and video recording.

Their free catalog is a must. One excellent beginning book is *Electronic Projects for Musicians*.

**PAIA Electronics**

The long time leader in lower end electronic music kits, PAIA offers a wide variety of unique products.

By musicians for musicians.

Three current projects are their *Fat Man Analog MIDI Synth*, their brand new Theremin kit (you did see it here first), and their "vacuum tube sound" front end preamps.

Free catalogs are offered. See below for their web home page.

Many thanks to PAIA honcho John Simonton, who contributed several key resources to this column.

**JASA and JAES**

Much in the way of original tech research and "horses mouth" music papers comes down in a pair of classic journals. The older of the two is JASA, or the *Journal of the Acoustical Society of America*. The newer is the *Journal of the Audio Engineering Society*.

**Experimental Musical Instruments**

This is one superbly well done and little-known magazine. While mostly about strange new ways of blowing on a gourd or twanging a coat hanger, both electronics and traditions are covered in depth.

**Online Resources**

Most current electronic music info appears online these days. Including the music itself. Let’s look at a few more examples...

[http://www.paia.com/paia](http://www.paia.com/paia) is quite strong on electronic music kit support.

[http://rowfl.cc.wsu.edu:8080/~n9343176/schems.html](http://rowfl.cc.wsu.edu:8080/~n9343176/schems.html) focuses on their schematics for guitar effects and related stomp boxes.

[http://www.hyperreal.com/machines](http://www.hyperreal.com/machines) has lots of synthesizer schematics.

[http://www.galaxy.einet.net/hytelnet/ful063.html](http://www.galaxy.einet.net/hytelnet/ful063.html) is a *data* base on commercial music albums.

[http://www.cec.er.net/~burnett/MDB](http://www.cec.er.net/~burnett/MDB) is a data base on commercial music albums.


[anonymous ftp: ftp.uwp.edu; path: pub/music](http://anonymous ftp: ftp.uwp.edu; path: pub/music) is a music archive on artists, discography, lyrics, and pictures.

[rec.music.makers.builders](http://rec.music.makers.builders) is the newsgroup for instruments and electronics.

[rec.music.makers.synth](http://rec.music.makers.synth) is one newsgroup with useful homebrew info in it.

To subscribe to the *synth-diy*, mail...
### ELECTRONIC MUSIC RESOURCES

<table>
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<tr>
<th>Company</th>
<th>Contact Information</th>
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<tbody>
<tr>
<td>Adobe Systems</td>
<td>PO Box 7900, Mountain View CA 94039 (800) 833-6687</td>
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<tr>
<td>American Organist</td>
<td>475 Riverside Drive Ste 1260 New York NY 10115 (212) 870-2163 FAX</td>
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<tr>
<td>Analog Devices</td>
<td>PO Box 9108, Norwood MA 02062 (617) 329-4700</td>
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<tr>
<td>Audio Amateur</td>
<td>Box 576, Peterborough NH 03458 (603) 924-9644</td>
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<tr>
<td>Burr-Brown</td>
<td>676 S Tucson Blvd, Tucson AZ 85706 (602) 746-1111</td>
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<tr>
<td>Clavier</td>
<td>200 Northfield Road, Northfield IL 60093 (708) 446-5000</td>
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<tr>
<td>Computers &amp; Music</td>
<td>847 Mission Street, San Francisco CA 94105 (800) 767-6161</td>
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<tr>
<td>Crystal Semiconductor</td>
<td>PO Box 1847, Austin TX 78744 (800) 888-5016</td>
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<tr>
<td>Diapson</td>
<td>380 E Northwest Hwy, Des Plaines IL 60016 (708) 298-6622</td>
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<tr>
<td>GEnie</td>
<td>401 N Washington St, Rockville MD 20850 (800) 638-9636</td>
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<tr>
<td>Glass Audio</td>
<td>PO Box 876, Peterborough NH 03458 (603) 924-9644</td>
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<tr>
<td>Guitar Player</td>
<td>20095 Stevens Creek, Cupertino CA 95014 (408) 446-1105</td>
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<tr>
<td>Integrated Circuit Sys</td>
<td>PO Box 968, Valley Forge PA 19482 (610) 635-5300</td>
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<tr>
<td>Journal AES</td>
<td>60 E 42nd St, New York NY 10165 (212) 661-2355</td>
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<tr>
<td>Jnl Am Organbuilding</td>
<td>Box 130982, Houston TX 77219 (713) 529-2212</td>
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<tr>
<td>Journal ASA</td>
<td>305 E 45th St, New York NY 10017 (212) 661-9404</td>
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<tr>
<td>PAEA Instruments</td>
<td>3200 Teakwood Ln, Edmond OK 73013 (405) 340-6300</td>
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<tr>
<td>Pedal Steel News</td>
<td>Box 248, Floral Park NY 11001</td>
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<tr>
<td>Piano Technicians Journal</td>
<td>3930 Washington Street, Kansas City MO 64111</td>
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<tr>
<td>Play Meter</td>
<td>PO Box 26970, New Orleans LA 70114 (504) 488-7003</td>
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<tr>
<td>Player Piano Company</td>
<td>704 E Douglas, Wichita KS 67202 (316) 263-3241</td>
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<tr>
<td>PMI</td>
<td>1500 Space Park Dr, Santa Clara CA 95052 (800) 943-1516</td>
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<tr>
<td>Ragtime</td>
<td>4218 Jessup #4B, Ceres CA 95307 (209) 668-0058</td>
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<tr>
<td>Reed Organ Society Bulletin</td>
<td>9670 Rix Street SE, Ada MI 49301 (616) 676-1188</td>
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<tr>
<td>Synergetics Dictionary</td>
<td>Reed Organ Society Bulletin 9670 Rix Street SE, Ada MI 49301 (616) 676-1188</td>
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<tr>
<td>Yamaha</td>
<td>6600 Orangehaver Avenue, Buena Park CA 90622 (714) 522-8011</td>
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**Autumn's Music Contest**

I used to publish lots of homebrew electronic music projects way back in Popular Electronics. Circa 1965-1973. But since I can not carry a tune in a bucket, I have tended to lose touch with the latest in the field.

So, for this month's contest, just tell me about any new electronic music resource I don't know about.

There will be a largish pile of my new Incredible Secret Money Machine II books going to the dozen or so better entries, plus an all-expense-paid (FOB Thatcher, AZ) tinaja quest for two that will go to the very best of all.

Let's hear from you. (*)

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(*) Microcomputer pioneer and guru Don Lancaster is the author of 33 books and countless tech articles. Don maintains his no-charge US tech helpline found at (520) 428-4073, besides offering all of his own books, reprints, and consulting services. Don also has two free catalogs full of his resource secrets waiting for you. Your best calling times are 8-5 on weekdays, Mountain Standard Time.

Funding and time constraints restrict this helpline service to US callers only.

Don is in the process of setting up his Guru's Lair at [http://www.tinaja.com](http://www.tinaja.com)

Full reprints and preprints of all Don's columns and ongoing tech support appear here. You can reach Don at Synergetics, Box 809, Thatcher, AZ 85552. Or send any messages to his US Internet address of don@tinaja.com.