

Don Lancaster's

# RESOURCE BIN

number forty three

## 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](http://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

**NEXT MONTH: Don looks at national and local resources for the physically disabled.**

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 Humania 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>

*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 traditionals 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> is quite strong on electronic music kit support.

<http://rowlf.cc.www.edu:8080/~n9343176/schems.html> focuses on their schematics for guitar effects and related stomp boxes.

<http://www.hyperreal.com/machines> has lots of synthesizer schematics.

<http://www.hk.net/~prs.midi.html> publishes the *Archives of Classic MIDI Sequences*.

<http://www.galaxy.einet.net/hytelnet/ful063.html> is a music and brain info database.

<http://www.cecer.army.mil/~burnett/MDB> is a data base on commercial music albums.

telnet: runner.utsa.edu login: imr provides the *CARISS* or *Computer-Assisted Retrieval Service System for Music*. Which covers music medicine and music therapy.

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

## new from DON LANCASTER

### ACTIVE FILTER COOKBOOK

The sixteenth (!) printing of Don's bible on analog op-amp lowpass, bandpass, and highpass active filters. De-mystified instant designs. **\$28.50**

### CMOS AND TTL COOKBOOKS

Millions of copies in print worldwide. THE two books for digital integrated circuit fundamentals. About as hands-on as you can get. **\$28.50** each.

### INCREDIBLE SECRET MONEY MACHINE II

Updated 2nd edition of Don's classic on setting up your own technical or craft venture. **\$18.50**

### LANCASTER CLASSICS LIBRARY

Don's best early stuff at a bargain price. Includes the CMOS Cookbook, The TTL Cookbook, Active Filter Cookbook, PostScript video, Case Against Patents, Incredible Secret Money Machine II, and Hardware Hacker II reprints. **\$119.50**

### LOTS OF OTHER GOODIES

Ask the Guru I or II or III	\$24.50
Hardware Hacker II, III or IV	\$24.50
Micro Cookbook I	\$19.50
PostScript Beginner Stuff	\$29.50
PostScript Show and Tell	\$29.50
Intro to PostScript Video	\$29.50
PostScript Reference II	\$34.50
PostScript Tutorial/Cookbook	\$22.50
PostScript by Example	\$32.50
Understanding PS Programming	\$29.50
PostScript: A Visual Approach	\$22.50
PostScript Program Design	\$24.50
Thinking in PostScript	\$22.50
LaserWriter Reference	\$19.50
Type 1 Font Format	\$16.50
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Whole works (all PostScript)	\$380.00
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The reprints from all Don's Midnight Engineering columns. Includes a broad range of real world, proven coverage on small scale technical startup ventures. Stuff you can use right now. **\$24.50**

### RESOURCE BIN I

A complete collection of all Don's Nuts & Volts columns to date, including a new index and his master names and numbers list. **\$24.50**

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Check Don's Guru's Lair at <http://www.tinaja.com> for interactive catalogs and online samples of Don's unique products. Searchable reprints and reference resources, too. Tech help, hot links to cool sites, consultants. email: [don@tinaja.com](mailto:don@tinaja.com)

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**SYNERGETICS**  
Box 809-NV  
Thatcher, AZ 85552  
(520) 428-4073

Write in 146 on Reader Service Card.

## ELECTRONIC MUSIC RESOURCES

<b>Adobe Systems</b> PO Box 7900 Mountain View CA 94039 (800) 833-6687	<b>Diapson</b> 380 E Northwest Hwy Des Plaines IL 60016 (708) 298-6622	<b>GENie</b> 401 N Washington St Rockville MD 20850 (800) 638-9636	<b>Mechanical Music</b> 887 E Orange Avenue St Paul MN 55106 (612) 774-2490	<b>Piano Technicians Journal</b> 3930 Washington Street Kansas City MO 64111	<b>Rough &amp; Tumble Engineers</b> Box 9 Kinzers PA 17535 (717) 442-4249
<b>American Organist</b> 475 Riverside Drive Ste 1260 New York NY 10115 (212) 870-2163 FAX	<b>Early Keyboard Journal</b> Box 32022 Charlotte NC 28232 (919) 842-4322	<b>Glass Audio</b> PO Box 876 Peterborough NH 03458 (603) 924-9464	<b>MIX Bookshelf</b> 6400 Hollis St #12 Emeryville CA 94608 (800) 233-9604	<b>Play Meter</b> PO Box 24970 New Orleans LA 70184 (504) 488-7003	<b>Sound Practices</b> Box 180562 Austin TX 78718 (512) 339-6229
<b>Analog Devices</b> PO Box 9106 Norwood MA 02062 (617) 329-4700	<b>Elderly Instrument</b> 1100 N Washington Lansing MI 48901 (517) 373-7890	<b>Guitar Player</b> 20095 Stevens Creek Cupertino CA 95014 (408) 446-1105	<b>Modern Keyboard</b> 1115 Broadway 8th FL New York NY 10010 (212) 807-7100	<b>Player Piano Company</b> 704 E Douglas Wichita KS 67202 (316) 263-3241	<b>Synergetics</b> Box 809 Thatcher AZ 85552 (602) 428-4073
<b>Audio Amateur</b> Box 576 Peterborough NH 03458 (603) 924-9464	<b>Electronic Musician</b> 6400 Hollis St #12 Emeryville CA 94608 (415) 653-3307	<b>Integrated Circuit Sys</b> PO Box 968 Valley Forge PA 19482 (610) 630-5300	<b>Music &amp; Sound Retailer</b> 25 Willowdale Avenue Port Washington NY 11050 (516) 767-2500	<b>PMI</b> 1500 Space Park Dr Santa Clara CA 95052 (800) 843-1515	<b>Theater Organ</b> Box 417490 Sacramento CA 95841 (916) 966-3172 FAX
<b>Burr-Brown</b> 6730 S Tucson Blvd Tucson AZ 85706 (602) 746-1111	<b>Ensoniq</b> 263 Great Valley Pkwy Malvern PA 19355 (610) 647-3930	<b>Journal AES</b> 60 E 42nd St Rm 2520 New York City NY 10165 (212) 647-3935	<b>Music Retailing</b> 70 Rt 202 North Peterborough NH 03458 (603) 924-0058	<b>Ragtime</b> 4218 Jessup #AB Ceres CA 95307 (209) 668-0366	<b>Tracker</b> Box 26811 Richmond VA 23261 (804) 659-9226
<b>Clavier</b> 200 Northfield Road Northfield IL 60093 (708) 446-5000	<b>Exp Musical Instruments</b> 1700 Old Rancheria Rd Nicasio CA 94946 (415) 662-2182	<b>Jnl Am Organbuilding</b> Box 130982 Houston TX 77219 (713) 529-2212	<b>MMR/Musical Merch Review</b> 100 Wells Avenue Newton MA 02159 (617) 964-5100	<b>Reed Organ Society Bulletin</b> 6907 Rix Street SE Ada MI 49301 (616) 676-1188	<b>Ulrichs Dictionary</b> 121 Chanlon Rd New Providence NJ 07974 (908) 771-7714
<b>Computers &amp; Music</b> 647 Mission Street San Francisco CA 94105 (800) 767-6161	<b>Factsheet Five</b> R Seth Friedman PO Box 170099 San Francisco CA 94117	<b>Journal ASA</b> 335 E 45th St New York City NY 10017 (212) 661-9404	<b>PAIA Electronics</b> 3200 Teakwood Ln Edmond OK 73013 (405) 340-6300	<b>RePlay</b> 22157 Clarendon St Woodland Hills CA 91365 (818) 347-3820	<b>Vox Humania Press</b> 150 Locust St Macungie PA 18062 (215) 966-2200
<b>Crystal Semiconductor</b> PO Box 17847 Austin TX 78744 (800) 888-5016	<b>Fistell's Microelectronics</b> 7023 E Colfax Denver CO 80220 (303) 393-6000	<b>Keyboard</b> 20085 Stevens Creek Blvd Cupertino CA 95014 (408) 446-1105	<b>Pedal Steel News</b> Box 248 Floral Park NY 11001	<b>Roland Digital</b> 7200 Dominion Circle Los Angeles CA 90040 (213) 685-5141	<b>Yamaha</b> 6600 Orangethorpe Avenue Buena Park CA 90622 (714) 522-9011

[majordoma@horus.sara.nl](mailto:majordoma@horus.sara.nl) then you *subscribe synth-diy* <your.email.address>. This is a new synthesizer resource.

To subscribe to *Bode*, route mail to [majordoma@veda.is](mailto:majordoma@veda.is) followed by a *subscribe bode* <your.email.address>

To subscribe to *analogue.heaven*, use [majordomo@hyperreal.com](mailto:majordomo@hyperreal.com)

Commercial online forums include America Online's SSS, plus GENie's MIDI (an 8000+ file library) or their MUSIC (5000+ files) RoundTables.

### Special Musical Interests

There are zillions of music special interest magazines, newsletters, and trade journals. As always, your best starting point is using that *Ulrichs Periodicals Dictionary*, available on line or at your local library.

A second great source for the *really* off-the-wall stuff is *FactSheet 5*.

Vacuum tube traditionalists should find *Glass Audio* and *Sound Practices* of interest. All any vacuum tube does is unreliably and inefficiently add hum, noise, and distortion to an otherwise clean audio channel.

A surprisingly large number of my helpline callers are building their own real pipe organs. Important resources here do include the *American Organist*,

*Clavier*, *Diapson*, *Tracker*, *Journal of American Organbuilding*, the *Reed Organ Bulletin*, and *Theater Organ*.

Older musicians should appreciate *Elderly Instruments*, or else that *Early Keyboard Journal*. Younger ones might favor *Guitar Player*, *Modern Keyboard*, *Pedal Steel News*, and *Keyboard*.

Hobby music projects often appear in *Popular Electronics*, *Electronics Now*, *Nuts & Volts*, and *Audio Amateur*.

For player pianos, *Mechanical Music* or the *Piano Technicians Journal*. Three good parts sources include *Player Piano Company*, *Rough and Tumble Engineers*, and *Ragtime*. For modern coin-op stuff, *RePlay* and *Play Meter*. We saw lots on jukebox resources in HACK73.PDF on my *tinaja.com*. And in the *Hardware Hacker* reprints.

The main music store trade journals do include *Music and Sound Retailing*, *Music Retailing*, and *MMR*.

For actual music production, try out *Recording* and *Mix* magazines.

### This Month's 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. ♦

*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.*

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