Don Lancaster's

Tech Musings

July, 1996

A "colorizer" for PostScript
Using binomial coeffecients
Laser printer repair resources
Magnetic field intensity paper
New Book-on-demand machine

For this month, I thought we'd look into a few applied math topics. I was rather poor at math through much of high school and college. It took a graduate level partial diff course for me to at last finally see the light.

There's a lot to be learned and big bucks to be made by playing around with numbers in one way or another. The one book that has done by far the most good for me over all the years is that *Mathematical Tables from the Handbook of Chemistry and Physics*.

From *CRC Publishing*.

The plot development is somewhat weak, but it's sure got a really great cast of characters. Alas, the book's ending is totally predictable.

My favorite current tool to explore math stuff is a *Hewlett-Packard* 4M+ printer. I use it as a general purpose PostScript Language computer. This route is rapid, easy, intuitive, highly graphic, and elegantly simple.

Let's look at a math topic or two…

Colorizing PostScript

I've got these great heaping piles of my column reprints that often use lighter grays for emphasis. Which looks great in hard copy. But kinda awful when online or on any color display. I needed some sneaky trick to let me easily "colorize" these files. To automatically provide *both* gray *and* color at the same time.

A PostScript *DeviceGray* black has a value of 0. White is 1. My preferred very light gray is 0.96. Set through PostScript's *setgray* operator. On a 106 line, 600 DPI screen.

There are many PS color rendering options. One is called *DeviceRGB*. If a PostScript or Acrobat program uses DeviceRGB color, a black-and-white printer should automatically convert everything *back* to gray. Using this rule shared with the NTSC color tv people…

$$gray = 0.3\,red + 0.59\,green + 0.11\,blue$$

The "funny numbers" come about because the eye is the most sensitive to green and least sensitive to blue. More on this in my MUSE98.PDF at *tinaja.com*. At any rate, any 0.96 gray is quite light. So light that we might end up with uselessly weak pastels if we are not careful.

We can see that our color choices might end up restricted. No matter. *One* tint (used in various saturations) is good enough to make each column look much better.

The trick is to automatically define carefully chosen red, blue, and green values *from* the given gray. That will, in turn, return that *same* gray back to the black and white printer.

A branch of mathematics known as *partial differential calculus* can give us a hint of which way to go.

Say you *only* change red. The gray will shift by 0.3 times as much as the red does. Thus, any one percent gray shift requires a 3.33 percent shift in red. Similarly, a one percent shift in gray needs only a 1.69 percent green change. But takes a whopping 9.09 percent shift in blue.

Thus, if you want nice colors for lighter grays that are not washed out, *back off on your blue first!*

Ferinstance. If you let $red = 1$ and let $green = 1$, our light gray equation can solve to …

$$blue = (gray - 0.89)/0.11$$

Which only works down to an 0.89 gray. So you need a different formula for darker grays. Say letting $blue = 0$ and $red = green$. Colorwise, as your gray gets darker, you start here with white. Then merge white and yellow,

```
%  A PostScript "colorizer" that causes black, white, and gray code to print
%  normally but converts all grays to on-screen or on-line color tints.

%  Insert colorizer near beginning of ps file where it can redefine -setgray-.

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/tintmat [
  {dup 0.842 ge {dup .7 mul .59 sub .11 div 1 exch setrgbcolor}
    {0.89 div dup 1.123 div exch 1.123 mul 0 setrgbcolor} ifelse} % lime 0
  {dup 0.59 ge {0.59 sub 0.41 div dup 1 exch setrgbcolor}
    {0.59 div 0 exch 0 setrgbcolor} ifelse}  % green 1
  {dup 0.11 ge {0.11 sub 0.89 div dup 1 setrgbcolor}
    {0.11 div 0 exch 0 exch setrgbcolor} ifelse}  % blue 2
  {dup 0.3 ge {0.3 sub 0.7 div 1 exch dup setrgbcolor}
    {0.3 div 0 0 setrgbcolor} ifelse}   % pink 3
  {dup 0.7 ge {0.7 sub 0.3 div 1 1 setrgbcolor}
    {0.7 div 0 exch dup setrgbcolor} ifelse} % turquoise 4
  {dup 0.41 ge {0.41 sub 0.59 div 1 exch 1 setrgbcolor}
    {0.41 div dup 0 exch setrgbcolor} ifelse}   % magenta 5
  {dup 0.89 ge {0.89 sub 0.11 div 1 exch 1 exch setrgbcolor}
    {0.89 div dup 0 setrgbcolor} ifelse}  % bright yellow 6
  {dup 0.731 ge {1 exch dup .41 mul .30 sub .11 div setrgbcolor}
    {0.856 div dup 1.155 mul exch 1.155 div 0 setrgbcolor} ifelse} % beige 7
      ] bind def

/tint 0 def                                   % sets the next tint proc

/setgray {tintmat tint get cvx exec} bind def      % redefines all grays

%  Certain applications will require a print to disk first. Files already
%  in Acrobat will also need redefinitions of -setcolor- and -setrgbcolor-.

%  Additional details in COLORIZE.PS on www.tinaja.com
```

Fig. 1 – A "COLORIZER" for black-and-white PostScript or Acrobat files.

NUMBER OF BITS IN WORD	NUMBER OF ONES IN WORD 0	1	2	3	4	5	6	7	8	9	10	11
1	1	1	-	-	-	-	-	-	-	-	-	-
2	1	2	1	-	-	-	-	-	-	-	-	-
3	1	3	3	1	-	-	-	-	-	-	-	-
4	1	4	6	4	1	-	-	-	-	-	-	-
5	1	5	10	10	5	1	-	-	-	-	-	-
6	1	6	15	20	15	6	1	-	-	-	-	-
7	1	7	21	35	35	21	7	1	-	-	-	-
8	1	8	28	56	70	56	28	8	1	-	-	-
9	1	9	36	84	126	126	84	36	9	1	-	-
10	1	10	45	120	210	252	210	120	45	10	1	-
11	1	11	55	165	330	462	462	330	165	55	11	1
12	1	12	66	220	495	792	924	792	495	220	66	12
13	1	13	78	286	715	1287	1716	1716	1287	715	286	78
14	1	14	91	364	1001	2002	3003	3432	3003	2002	1001	364
15	1	15	105	455	1365	3003	5005	6435	6435	5005	3003	1365
16	1	16	120	560	1820	4368	8008	11440	12870	11440	8008	4368
17	1	17	136	680	2380	6188	12376	19448	24310	24310	19448	12376
18	1	18	153	816	3060	8568	18564	31824	43758	48620	43758	31824
19	1	19	171	969	3876	11628	27132	50388	75582	92378	92378	75582
20	1	20	190	1140	4845	15504	38760	77520	125970	167960	184756	167960
21	1	21	210	1330	5985	20349	54264	116280	203490	293930	352716	352716
22	1	22	231	1540	7315	26334	74613	170544	319770	497420	646646	705432

Fig. 2 – THIS BINOMIAL COEFFICIENTS TABLE quickly answers such questions as "how many binary words of length "n" have "k" ones in them? Any rightmost "missing" values can be found by symmetry.

and finally go a full bright yellow at 0.89 gray. Below that, you drop down into the "darker" unsaturated yellows through brown to black.

Figure one shows us some possible shiftings. Uh, whoops. Backing off totally on the blue can leave you with a color which is best described as an *infirmary yellow*. Org. The two I like the best are the pastel green and the somewhat brighter lime green.

To use these routines, just prepend them to your existing file. But do so in a position where they can redefine *setgray*. If you are in some app that prevents you from messing with the code, simply do a *print to disk* first.

Should your files already be in an *Acrobat* format, you may also have to print to disk, redefine *setcolor* and *setrgbcolor*, and then redistill. More details on this in COLORIZE.PDF on *tinaja.com*

Binomial Coefficients

Now that I have just made you an expert in applying partial differential equations, let us go on to something tougher. What totally amazes me is how many times over the years that I've ended up right back on the very same page in the book. One that lists *binomial coefficients*.

These are intended for use by the statistics folks. To answer questions such as "how many combinations of six coins are there that will have two heads and four tails?"

That same problem restated has become quite important in my magic sinewave work: "Generate all binary words of length *n* with *k* ones.

Well, let's see here. Say you have four bits. There's 2^4 = 16 possible words. There will be one word of no ones (0000). Plus four words having single ones (0001),(0010),(0100), (1000). There will be six words of two ones, namely (0011),(0101), (1001),(0110),(1010), and (1100).

Similarly, there will be four words that have three ones (0111),(1011), (1101),(1110); and a remaining word (1111) of four ones.

Go to six bits and we start to get messy with 64 combinations. But we can cheat. Of these 64 combinations, there will be a word with no ones and a word with six ones. There will be six having a single one and six with five ones. Taken together, these add up to 14 cases.

There will apparently be 5+4+3+2 +1 = 15 cases with two ones. Plus 15 similar cases of four ones. Which, by default, leaves us with 20 ones for the cases of three ones.

As you can imagine, exhaustive listings get old as the number of bits in the word go up. But we can clearly see a pattern emerging. There *always* will be one word with no ones and one word with all ones. There *always* will be *n* words *having* a single one in all bit positions. There will *always* be *n* words *lacking* a single one in all bit positions.

For the *complementary* "two ones" and "all-but-two-ones" cases, there will be the sum of (k-1)+(k-2)+…+2+ 1 combinations. These inner results will seem more ugly. But they end up rather simple to find.

Figure two shows us the table of binomial coefficients. Note how the combinations rapidly get out of hand. The key rule to generate this table is simple enough: To produce any new value in any given column, add your *previous* value to the value *to its left*. Substituting zeros for blanks on any "empty" column positions.

Restating it geographicaly, each "here" value equals the total of its "north" and "northwest" neighbors.

Continued to extremes, we could find that there are 2,704,156 possible 24 bit words with 12 ones in them.

While you can easily write a trivial computer program that exhaustively searches for the k-of-n combinations, this approach rapidly gets inefficient. In the 3-of-18 case, you'd have to search out 262,144 combinations for a mere 816 final results.

Figure three shows some efficient PostScript code that I use to generate sequential strings for ones and zeros of length *n*. Sequences which do have precisely *k* ones in them.

This is one example of *reentrant* code. Well, sort of, anyway. To find higher values of *k*, just continue the expansion in the obvious direction.

Bunches more on magic sinewave opportunities in my MSINPROP.PDF on *tinaja.com*

Laser Printer Repairs

Don Thompson just mailed me a revised copy of his superb *Mastering Laser Printer Service* manual. While pricey, this is by far *the* most useful servicing resource. Don also has first quality repair seminars. Plus lots of repair parts. And has special pricing for readers of this column.

I've listed some other laser printer resources in this month's sidebar.

Recharger magazine is the place to go for info on rebuilding procedures and toner supplies. I currently do use *Static Control Components*.

Getting machine specific service info can be tricky. Most laser printers use *Canon* engines. *Hewlett Packard Manuals* has costly but outstanding repair manuals for all their LaserJets that use Canon engines.

These same manuals can be highly useful for servicing *Apple*, *QMS*, and other brands. HP also carries most modules and has instant delivery. But they charge full list price and limit themselves to entire modules. Rather than individual component parts.

A number of firms offer rebuilding and replacement modules at far lower prices. Some as "pre-exchanges". I have also listed a few of these in our resource sidebar.

Your most common laser printers likely to need repairs are still those that use the older Canon SX engines. Although getting a tad long in the tooth, there sure are a lot of these 300 DPI workhorses still out there.

Having high copy counts and low street resale prices. Typical models were the older Apple NTX and newer LaserWriter G, The Hewlett Packard LaserJet 3 or 3D. Or the PS820 from *QMS*. The HP manual 33440-90904 is a "must have" resource for working on any of these machines.

Don T. has a nice SX maintainence video. Along with a whole bunch of others for most of the newer engines. While the comments that follow are SX specific, similar attacks ought to work on most laser printers…

The first step on any laser printer repair is the careful visual inspection. Then get the problem to show up or otherwise become obvious. Often a simple cable check and a rebooting (host, network, *and* printer!) will get you back running properly. At other times, operator stupidity will be the real problem. Such as forgetting to pull the cartridge sealing strip.

Yet other times, hidden paper jams may be the culprit. One "tool" I've found rather handy here is a seven inch wide sheet of parchment cover stock. By gently sawing this through various points in the paper path, jam problems can often be cleared.

```
% A PostScript utility to generate all possible binary words of length "n" having "k"
% ones in them. Send to any PostScript device using recordable two-way com.

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/bitsinword  10 def                 % set the number of bits in the word

/ws0 bitsinword string def          % generate a workstring
/kproc0 {ws0 == flush} def          % define a proc that uses the string.

/0k0{kproc0} def
/1k0{false exch 1 ws0 length 1 sub{dup 3 -1 roll{1 sub ws0 exch 48 put}{pop ws0
   dup length 1 sub 48 put}ifelse ws0 exch 49 put kproc0 true} for pop} bind def
/2k0{false exch 1 ws0 length 2 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put} {pop ws0
   dup length 2 sub 48 put}ifelse ws0 exch 49 put 1 add 1k0 true} for pop} bind def
/3k0{false exch 1 ws0 length 3 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put}{pop ws0
   dup length 3 sub 48 put}ifelse ws0 exch 49 put 1 add 2k0 true} for pop} bind def
/4k0{false exch 1 ws0 length 4 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put} {pop ws0
   dup length 4 sub 48 put}ifelse ws0 exch 49 put 1 add 3k0 true} for pop} bind def
/5k0{false exch 1 ws0 length 5 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put} {pop ws0
   dup length 5 sub 48 put}ifelse ws0 exch 49 put 1 add 4k0 true} for pop} bind def
/6k0{false exch 1 ws0 length 6 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put} {pop ws0
   dup length 6 sub 48 put}ifelse ws0 exch 49 put 1 add 5k0 true} for pop} bind def
/7k0{false exch 1 ws0 length 7 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put} {pop ws0
   dup length 7 sub 48 put}ifelse ws0 exch 49 put 1 add 6k0 true}  for pop} bind def
/8k0{false exch 1 ws0 length 8 sub{dup dup 4 -1 roll{1 sub ws0 exch 48 put} {pop ws0
   dup length 8 sub 48 put}ifelse ws0 exch 49 put 1 add 7k0 true} for pop} bind def

%       (higher numbers ones or additional strings can be added here if needed. )

% //// demo - remove or alter before reuse. ////

% to generate all TEN bit words having FIVE ones in them...

0 5k0                               % five ones entry point, preceeded by zero
quit
```

Fig. 3 – A UTILITY TO GENERATE n-of-k binary bit sequences.

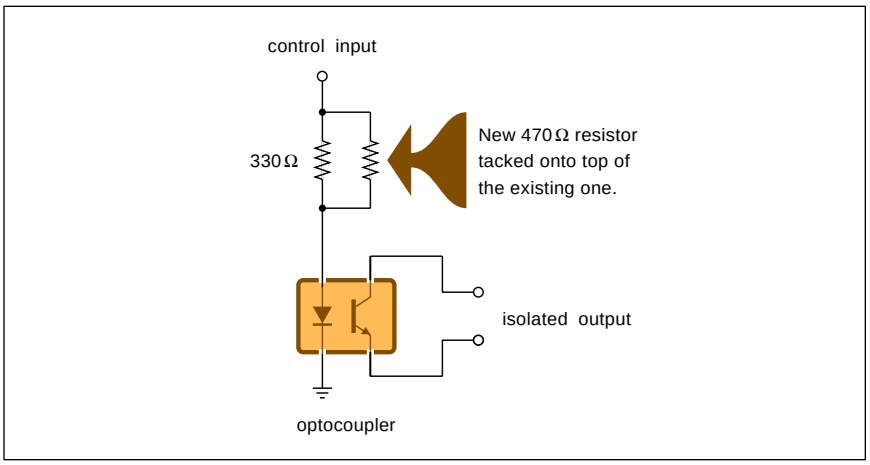

Fig. 4 – CERTAIN OPTOCOUPLERS MAY "RUN DOWN" after 10,000 or so hours of operation. Sometimes boosting the LED current by adding a parallel resistor can cheaply and quickly restore proper performance.

LASER PRINTER REPAIR RESOURCES

Advanced Recharging
4938 Sharp Street
Dallas TX 75247
(800) 437-2296

Apple Computer
20525 Mariani Ave
Cupertino CA 95014
(408) 996-1010

Hewlett-Packard Manuals
19310 Pruneridge Ave
Cupertino CA 94014
(800) 752-0900

Jensen Tools
7815 S 46th St
Phoenix AZ 85044
(602) 968-6231

LaserLand
2655 Orchard Lake Rd #119
Sylvan Lake MI 48320
(800) 60-TONER

National Parts Depot
31 Elkay Drive
Chester NY 10918
(800) 524-8338

Oasis Imaging Products
23220 Del Lago
Laguna Hills CA 92653
(800) 822-7661

PBTI Electronic Imaging
7195 30th Avenue N
St Petersburg FL 33710
(813) 345-0010

QMS/Laser Connection
PO Box 81250
Mobile AL 36689
(205) 633-4300

Quality Laser Charge
1117 N. Equestrian Way
Prescott, AZ 86303
(800) 828-6649

Recharger
4218 W Charleston Blvd
Las Vegas NV 89102
(702) 438-5557

Static Control Comps
3115 H Siler Dr
Sanford NC 27331
(800) 488-2424

Don Thompson
6 Morgan #112
Irvine CA 92718
(714) 855-3838

TonerPlus
8222 N Lamar Blvd #E44
Austin TX 78753
(800) 383-5564

Total System 2000
47-00 33rd Street
Long Island City NY 11101
(800) 682-7371

World Recharging Expo
4218 W. Charleston Blvd.
Las Vegas, NV 89102
(702) 438-5557

The second step is to substitute the toner cartridge and see if the problem goes away. Some cart problems are easily fixed; others are either fatal or not worth the effort.

More on toner cartridge refilling are in HACK40.PDF, HACK78.PDF, or in TONERTRX.PDF

The third big check is to place the printer in a darkened room and look into the paper exit area. On startup, an intermittent and dull yellow glow should tell you when the fuser lamp is cycling properly. Note that the lid has to be closed or all the interlocks bypassed for this lamp to light.

The fusion assembly accounts for a lot of your remaining problems. Such as toner caking or a roller cracking; stripping of that notorious 14 tooth gear; a burned out fuser lamp; a bent or a broken paper exit sensor; or a coated or defective thermoprotector.

A fuser substitution is the best way to test for all these problems. A fuser exchange only costs $50 or so. If you want to do the repairs yourself, *Don Thompson* has an elaborate kit for fuser rebuilding.

There's only four screws holding your fuser in place. To reach these, get yourself a hard-to-find *extra long* Phillips screwdriver.

Jensen Tools carries them. Then put a *tiny* dab of beeswax on the tip. The fuser pulls straight up after these screws are removed. Be careful with the connector pins!

A big warning: *Never touch that fuser lamp!* Fingerprint oil on that quartz bulb causes a local hot spot which can destory the lamp. Handle this one *gently* by the extreme ends.

Or else wear cotton gloves.

If the fuser lamp seems ok but still doesn't light, the problem may lie in that expensive ac power supply. The typical cure is to swap out the triac, two resistors, and the optoisolator. Again, Don Thompson has a nice kit for this. One that can save you big bucks. But needs careful soldering.

The *corona charging* assembly is immediately in front of the cartridge area. A delicate wire here may need Q-tip cleaning or replacement. Also, the right end of this wire fits in an insulated block. Toner buildup here can cause imaging problems.

Clean corona charging assemblies are particularly important on duplex printers. Such as the HP 3D. Images with "rain" or "bunches of grapes" on one page side only are often caused by a dirty corona charging assembly. The charging assembly has to work much harder on the back side, since it is dealing with a heated sheet.

NEED HELP?

Phone or write all your US Tech Musings questions to:

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Thatcher, AZ, 85552
(520) 428-4073

US email: *don@tinaja.com*
Web page: *www.tinaja.com*

Paper pickup problems are usually cured by replacing the pickup rollers or the registration assembly. Both of these are simple and cheap to do. Be extra careful of the fiber optic laser link when doing any service.

One SX problem which I seem to have seen way more than my share of: Those path-sensing optocouplers may "run down" after 10,000 hours of operation. Which is real easy to rack up on any machine that gets left on continuously. The usual symptom is that the paper jam lights lie. Either always or intermittently.

You might blast the suspect opto with some spray cooler and watch for changes. Cleaning also helps.

One trick I have used is shown in figure four. If the optocoupler is just barely intermittent, you could easily add a new resistor in parallel with the existing one that sets the current to the LED. This runs the LED brighter and may cure your problem. It is far easier to tack on a new resistor than it is to replace an optocoupler.

Several other SX tips: There is a hidden mirror found above the toner cartridge. A piece of cathair here can cause vertical stripes down the page. It is a front surface mirror, so clean it *very* carefully using a Q-tip. A metal gate has to be slid sideways to access this hidden mirror.

The *vertical spacing* between page defects can usually tell you whether you have a cartridge drum, magnetic roller, or fusion roller problem.

Gear noise can often be cured by a careful cleaning that *totally* removes

NAMES AND NUMBERS

Adobe Acrobat System
1585 Charleston Rd
Mountain View CA 94039
(800) 833-6687

Alfa Products
PO Box 8247
Ward Hill MA 01835
(800) 343-0660

CRC Publishing
2000 Corporate Blvd NW
Boca Raton FL 33487
(407) 994-0555

Digital Magic
10 Tara Blvd 5th Floor
Nashua NH 03062
(603) 891-9168

Fisher Scientific
711 Forbes Ave
Pittsburgh PA 15219
(412) 562-8300

Fluke
PO Box 9090
Everett WA 98206
(800) 443-5853

Hewlett-Packard
PO Box 10301
Palo Alto CA 94303
(415) 857-1501

Home Theater
29160 Heathercliff Rd Ste 200
Malibu CA 90265
(301) 589-3100

Lindsay Publications
PO Box 538
Bradley IL 60915
(815) 935-5353

Magnet Sales
11248 Playa court
Culver City CA 90230
(800) 421-6692

Maxim
120 San Gabriel Dr
Sunnyvale CA 94086
(800) 998-8800

Mitel
2321 Morena Blvd #M
San Diego CA 92110
(619) 276-3421

New Wireless Pioneers
Box 398
Elma NY 14059
(716) 681-3186

PC AI
3310 W Bell Road Ste 119
Phoneix AZ 85023
(602) 971-1869

Rutgers University Press
7 College Avenue
New Burnswick NJ 08903
(908) 932-1766

Synergetics
Box 809
Thatcher AZ 85552
(520) 428-4073

Texas Instruments
PO Box 809066
Dallas TX 75380
(800) 336-5236

Visual Developer
7339 E Acoma Drive Ste 7
Scottsdale AZ 85260
(602) 483-0192

any toner. SX connectors are rather flakey. Sometimes reseating them or *gently* closing their contacts can cure maddingly infuriating intermittents.

Especially on the main motor.

Squeaks are not a serious problem. Except for their driving the user up the wall. A *tiny* amount of grease in the right place is the usual cure.

A continuous growling can usually be traced to that hidden and "secret" lower fan. Usually vacuuming off the clumped dust and adding a drop of oil is all that is required. A similar drop of oil can also free the upper fan bearings as well.

When working on the upper fan, be certain to clean or replace the ozone filter. Note that a slow upper fan can cause overheating that, in turn, leads to more serious problems. A "roasted toner" smell usually gets caused by a slow or jammed fan.

Finally, of course, an intermittent muffled yowling might sometimes be cured by opening up your SX lid and letting the cat out.

A Superb New Printer

I've long been seeking a "perfect" laser printer for my Book-on-demand publishing. The goals here include genuine *Adobe* PostScript level 2 or higher, a two sided printing duplexer, a companion hard disk, a *Canon* or better engine; recharging economics better than 0.1 cents per page.

All manuals and all parts readily available; A 600 DPI enhanced res; superb grays; photo enhancements; big trays; 16 pages per minute; and a street price under $1900. And perhaps an optional 11 x 17 capability.

That *Hewlett-Packard* 4M+ sure came close. It more or less had all of these features except for an essential

hard disk. The hard disk lets you do *unattended* BOD production, besides stashing all your files and fonts. And dramatically reducing the amount of communications needed.

The 4M+ street price is $1590 or so. Their print quality (especially on photos) was a quantum leap over anything previous.

You can shortly expect a 5M+ at the same price that should include an optional hard disk.

But meanwhile, there is a brand new "big brudder" machine called the 5SiMX. I've got one of these, and it is *absolutely ideal* for most serious self-publishing. Yeah, this one seems expensive. But four or five of these $4000 class machines used in parallel can utterly and totally blow away a $225,000 Xerox Docutec!

Let's see, 24 pages per minute. A full 11x17. A well designed slide-in duplexer *and* hard disk both present. Big trays, with even bigger ones as an option. Real PostScript. High wear items (fuser, pickup rollers, etc..) easily snap out for easy maint.

Problems so far have been minor. Their factory assembly missaligned a plastic duplexer tab that caused jams. Loosening two screws and placing tab A into slot B where it obviously belonged fixed this.

While there's Ethernet, Appletalk, and high speed *bidirectional* parallel interfaces, I sorely lacked a plain old serial input. Some external adaptor should fix this. And you can't really fault HP for leaving a lesser used and slow interface off a fast machine.

Hewlett Packard has a free demo CD ROM on the SiMX. Two of them actually. But the second one is tricky to scam without the printer.

Ask for their *LaserJet 5SiMX Test Drive*. And their *Personal Trainer.*

You'll find more on BOD in my *Book-on-demand Publishing Kit*. For other self-publishing options, check PUBALTS.PDF on *tinaja.com*

Names & Numbers

From *Mitel*, a fat new data book on *Analog and Digital Telecomm Data*. From *Maxim*, the *1996 New Product Selector Guide*. Maxim is generous on free evalutaion samples.

From *Fluke*, a free new video on *Managing Electrical Power Systems*. From *Texas Instruments*, some free samples on their TSL240 series of light to frequency converters.

From *Lindsay Publications*, a reprint of a classic 1920 book on *How to Make and Use a Small Chemical Laboratory*.

One crucial danger in homebrew chemistry, though: Certain of those unknown bargain priced direct mail chem lab supply ads might in fact be DEA sting operations. It may be best to stick with the name brand biggies such as *Fisher* or *Alpha*.

Type MRI-G Magnetic paper which can show you field intensity patterns is sold by *Magnet Sales*.

Rare early radio publications are offered by *New Wireless Pioneers*.

One fascinating book is *American Plastic; A Cultural History*. Since the author is an architect, the book has an interesting slant. From the *Rutgers University Press*.

There seem to be zillions of new trade journals and other mags coming out of the woodwork. This morning's collection included *Home Theater* on premium consumer audio and video; *Visual Developer* for Visual Basic users, *PC AI* for artificial intelligence and fuzzy logic; and *Digital Magic*. The latter is on animation for digital entertainment.

For all the fundamentals of digital integrated circuits, check into my classic *CMOS Cookbook* or else my *TTL Cookbook*. Also bargain priced in my *Lancaster Classics Library*. Per my nearby *Synergetics* ad.

I've got my *http://www.tinaja.com* web site up and working. ✦