## Further Faces

Dominik Wujastyk

Since 'The Many Faces of TEX' appeared in issue
**9.2** of *TUGboat*,[1] information about METAfonts has
continued to flow in, thankfully in somewhat di-
minished quantities. Since I wrote the last article
I have moved from the USA to England, and al-
though all the network services are available here
too (at a price), in practice Janet is not as open a
medium as the Internet, and I feel it is more likely
now that I might miss news about fonts, especially
if it appears in UseNet, to which I currently have
no access. I particularly miss the astonishing power
of the American brand of FTP. However, the vast
TEX archive at Aston, maintained by Peter Abbott,
is more comprehensive than any other I know of,
and NIFTP and mail server access to this archive
greatly compensates for the sense of network isola-
tion. All the same, if you know of any METAfonts
that I have not mentioned, I would be glad of the
news.

For new subscribers to *TUGboat*, issue **9.2** con-
tained a survey of the existing fonts known to be
available for use with TEX, including non-roman
scripts, other styles, and much besides. That is-
sue also included METAFONT code and examples
for a new punk METAfont called just PUNK, by Don
Knuth.[2] Perhaps the most extraordinary part of
that article is Don's description of how he coded the
font, extremely rapidly, and with no reference at all
to drawings for the letters from V to Z, producing
the METAFONT code as fast as he could type! This
demonstrates a completely new paradigm of type-
face design and creation, which many graphic de-
signers will find alien, but which evidently works for
some people, at least for smallish projects such as
the punk typeface.

People interested in METAFONT should be
aware that in addition to past issues of *TUGboat*,
TEXhax and UKTEX, Don Hosek's network mag-
azine TEXMaG has regularly included information
about fonts, and is required reading for META-
FONTers. Volume 2, issue 5, in particular, was ded-
icated to non-English TEX, and discussed Icelandic,
German, French, ancient Irish, and the problems
of foreign language hyphenation. Earlier issue of
TEXMaG have also contained technical descriptions
of TEX font file formats, etc. For information on sub-

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[1] 'The Many Faces of TEX: a Survey of Digital
METAfonts', *TUGboat* **9.2** (1988), 131–151.

[2] 'A Punk Meta-font', *TUGboat* **9.2** (1988), 152–
168.

scriptions or back issues, contact Don Hosek, net-
work address: `DHosek@HMCVAX.Bitnet`.

Once again, I am beholden to those who pro-
vided the information I have merely marshalled be-
low.

## 1   Music

UKTEX 1988, issues 28 and 29, carried an exchange
of information recently, concerning the use of TEX
to typeset music. This very challenging application
has been receiving some attention, and the work to
date was announced in the Music Research Digest.
Thence it found its way to UKTEX. Phillip T. Con-
rad provided summaries of the work of Dunne and
Jürgensen, that of Schofer and Steinbach, and of his
own.

### 1.1   Dunne and Jürgensen

Dunne and Jürgensen conducted research at the
University of Western Ontario; they defined the con-
cept of i-marks and p-marks. I-marks are invariant
marks, the kind of marks that can be put into a font
and typeset easily with TEX. P-marks are parame-
terized marks whose shape and size varies according
to certain parameters. The only p-marks TEX is ca-
pable of typesetting are the horizontal and vertical
rules. Dunne and Jürgensen use PostScript to aug-
ment the capability of TEX with a special version of
dvi2ps.

Shane Dunne wrote to Sebastian Rahtz in Au-
gust 1988, about his work on music typesetting, and
Sebastian reproduced his letter in UKTEX, issue 28.
Shane said the following:

> I was working on music printing per se
> about a year ago, and developed a rudimen-
> tary music-setting prototype based on TEX
> and PostScript. This system knows noth-
> ing of the rules of music formatting; the
> user describes the desired graphic result di-
> rectly to TEX, using its glue-setting capabil-
> ities to handle various problems of spacing.
> These days I have broadened my research
> focus to encompass all types of "specialized
> notations" — those which use a fixed reper-
> toire of symbolic marks — including music
> and music-like notations, logic diagrams,
> schematic representations of all kinds (e.g.,
> of automata), flow diagrams, etc. I think
> the existing "typesetting" paradigm can be
> extended to "marksetting", where a "mark"
> is any kind of symbol, not necessarily of
> fixed form like a text character, but possi-
> bly dependent on one or more parameters
> (e.g., 2 endpoints for a line segment). I

am trying to develop a design for a general-purpose marksetting system, which can be used as a software basis for any number of specialized formatting programs, i.e., a different front-end program for each class of notation.

I am doing this research towards a Master's thesis in Computer Science, which I hope to complete before the end of December. In the meantime there is one technical report which discusses my earlier work on music-setting, including the prototype, and contains some early ideas about general mark-setting.[3] ...

My approach was simpler [than that of Schofer and Steinbach]; I used PostScript's powerful graphic primitives to define parametrized procedures to create things like beams and slurs. Schofer and Steinbach's fonts simply include huge numbers of different beam and slur characters, at different slants, etc., to handle a reasonable set of cases. The results look very good.

Dunne has been somewhat overwhelmed by responses to this report on his work, which was in fact not really intended for general distribution. He followed up with a note which appeared in UKTEX 1988, issue 29, to the effect that he had received a number of e-mail requests for more information from around the world. While pleased at the level of interest in his research, he explained that, just at the moment, he is not in a good position to reply to these queries:

> My problem is that right now, I am at a critical stage of writing my Master's thesis on this topic, and I simply cannot afford the time to reply to all the letters I am receiving. Also, while I would love to send everyone a copy of my recent report, that will take time and money I don't have. I'm going to try and convince my University to take care of it.
>
> On a more positive note, my plans for the near future include finishing my thesis by this December, preparing a paper based on it for one of the computing journals (I'll announce which one when I know), and preparing a distribution version of my mark-setting prototype. (The prototype cannot be distributed as is, because it's written for an experimental programming

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[3] University of Western Ontario Technical Report 171.

system that only existed here, and is now obsolete. It won't take much effort to turn it into straight C code, though.)

So while I appreciate the interest in my work, I just wanted to let the ... readers know that I'll be a bit of a hermit for the next few months, and that right now, I don't really have anything in the way of software to distribute.

### Contact (or not!)

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University of Western Ontario,
London, Ontario, N6A 5B7
CANADA
Net: `shane@uwocsd.UWO.CA`,
`shane@UWOVAX.Bitnet`
UseNet from US: `...!{ihnp4!decvax|seismo}!`
`{watmath|utzoo}!julian!uwocsd!shane`
UseNet from Europe: `...!mcvax!seismo`
`!watmath!julian!uwocsd!shane`

### 1.2 Schofer and Steinbach

There is a thesis written by Angelika Schofer and Andrea Steinbach at the Institut für Angewandte Mathematik at the Rheinische Friedrich-Wilhelms-Universität at Bonn, entitled *Automatisierter Notensatz mit TEX*.

Schofer and Steinbach operated from the assumption that a font of beams and slurs is in fact feasible; they appear to have generated just such a font, and they use plain TEX alone. Their system appears to 'understand' some form of music-description language, and to apply music-setting rules automatically. The music is printed with TEX by means of the special fonts.

### Availability

A copy of their work (in German) may be obtained for 25DM by writing to the Institut at:
Wegler Straße 6,
5300 Bonn,
Federal Republic of Germany.

### 1.3 Conrad

Phillip T. Conrad noted that he is currently (August 1988) finishing a Master's thesis, at West Virginia University in Morgantown WV, which presents a prototype system for typesetting music notation with TEX. He noted that:

> It would seem that the central obstacle to musical typesetting with TEX is the production of slurs (ties, phrase marks) and

slanted beams. In John Gourlay's cover story in the May 1986 cover story of *Communications of the ACM*, he submits that it is a fair assumption that no two beams or slurs are precisely identical, so it would not be feasible to produce a font of all the possible slurs or beams. I have operated from this premise, as have Dunne and Jürgensen.
...

My own approach builds on the previous work at the Ohio State University of Gourlay et al. announced in the *CACM* article mentioned above. I use the TEXtyl program of John Renner (OSU Tech Report OSU-CISRC-4/87-TR9) rather than PostScript to draw the beams and slurs. In theory this provides device independence; in practice, the following restrictions apply:

1) The target system must support METAFONT for generation of the vector fonts necessary to TEXtyl,

2) Three Pascal programs and one C program must be ported to the target system; at this time, the programs are written for only BSD Unix 4.3.

**Availability**

For copies of Conrad's thesis please contact him at the following address:
Phillip T. Conrad,
401–K E. 3rd Street,
Wilmington DE 19801-3964,
U. S. A.
Phone: (302)-652-3938

**2   Hershey Fonts**

Just as I had begun wondering about the Hershey fonts, Jim Seidman asked about them in TEXhax 1988, issue 70.

**2.1   Guthery**

Dean Guenther (`Guenther@WSUVM1.Bitnet`) answered in issue 73 that Scott Guthery, (Phone: 512-258-0785) has the Hershey fonts with TFMs for a nominal fee in the region of $20 or $30.

**2.2   Kesner**

A few weeks later, TEXhax 1988, issue 90, carried a letter from Oliver Kesner (9 October 1988), also in answer to Seidman's query, describing his own work converting Hershey fonts for use with TEX. I reproduce what he said:

> Hershey fonts for the IBM PC are available from SoftCraft, Inc., and from Austin Code

Works. The SoftCraft set consists of four separate databases:

- `HERSHEY.CHR`: 1594 characters,
- `ORIENT.CHR`: 758 characters,
- `PERSIAN.CHR`: 135 characters,
- `HEBREW.CHR`: 49 characters.

The `HERSHEY.CHR` database includes, besides several Roman typefaces, Greek, Russian, German Fraktur, and a variety of graphic symbols; the `ORIENT.CHR` database has Hiragana, Katakana, and 623 Kanji characters.

The format of the SoftCraft Hershey databases is given in their *Font Editing: EFONT/CFONT User's Manual* on p. A5-2. Using this description, I wrote ... [a] Turbo Pascal 4.0 program to generate METAFONT source code from the Hershey plotter directives. ...

The characters in the Austin Code Works Hershey database are numbered 1–4326, with gaps, for a total of 1,377 different alphabetic and graphic characters. The format is described in Norman M. Wolcott and Joseph Hilsenrath, *A Contribution to Computer Typesetting Techniques: Tables of Coordinates for Hershey's Repertory of Occidental Type Fonts and Graphic Symbols*, U.S. Department of Commerce, National Bureau of Standards, April 1976.

Oliver has provided the Turbo Pascal 4.0 source code of

`HERSHEY.PAS`: a program that generates META-FONT source code from a Hershey character database in SoftCraft format, and

`ACWtoSC.PAS`: a program that converts the Hershey font tables distributed by The Austin Code Works to the format expected by the Cfont program of SoftCraft, Inc. I.e., it converts the ACW Hershey database to SoftCraft format, from which `HERSHEY.PAS` can generate META-FONT.

He also provides a pair of example files, `ORIENT.LOG` (the output of `HERSHEY.PAS`) and `ORIENT.MF`, which contain a couple of Japanese Hershey characters, and a set of font parameters respectively. I ran these through METAFONT, and was able to print the characters without a hitch.

**Terms of Availability**

The above information was forwarded to TEXhax by Oliver's son, Jeff Kesner, who has an e-mail address

and is happy to act as postman. Contact him at: `jok%gpu.utcs.toronto.edu@RELAY.CS.NET` .

The Pascal source code (about 14k) is available by anonymous FTP from `Score.Stanford.edu` (and from the Aston archive) as file `Kesner.txh` in the directory `<tex.texhax>`.

## 3   Armenian

### 3.1   Karagueuzian

Emma Pease also informed me that there is a family of Armenian fonts (created with old METAFONT) "wandering around CSLI". Dikran Karagueuzian designed and created these fonts in 1983, modelling them on Knuth's old CMR fonts. This means that they look good in bilingual typesetting with CMR. In fact, there is also an Armenian TeX to go with these fonts. Its hyphenating algorithm, designed by John Hobby and Dikran Karagueuzian, is functional but, according to Dikran, not perfect, so that the user may have to fiddle with the typeset material at the end.

### Contact

The Armenian family of fonts, as well as the Armenian TeX, is available to anyone who wishes to use them. Contact Dikran Karagueuzian (`dikran@csli.stanford.edu`).

## 4   Logic Diagrams

UKTeX 1988, issue 30, included a letter from David Osborne (`cczdao@uk.ac.nott.clan`) mentioning a font called `milstd.mf` created by Rick Simpson for drawing electrical symbols. He included the META-FONT source code for the font, and in the following issue of UKTeX, a small set of TeX macros were published, for making the logical symbols easier to use within plain TeX or LaTeX. The font consists of the following 25 symbols: slanting line at 45-degree angle for marking busses in logic diagrams; AND, NAND, OR, NOR gates, facing to the right, down, left and up; buffer and inverter, each facing to the right, down, left and up.

## 5   Tamil

### 5.1   Arthanari

There has been no communication from Mr. Arthanari, and it looks very much as though the Ridgeway–Schiffman font holds the greatest promise of a usable Tamil font in the near future.

## 6   Telugu

The latest news from Mukkavilli Lakshmankumar and his wife Lakshmi about TeluguTeX is as follows:

We have decided on the grid framework for the font. We also have thought about different global variables that could be used to control various features of the font. We have decided on a set of primitive curves. These are like subroutines that can be used by different letters. Some of these are coded in METAFONT. Only control points are determined. We are yet to determine the stroke thickness and pen angles at the control points. Since we are not imitating any font, it takes a lot of time trying to ensure that various curves are correct. Our approach is to make a rough sketch and then determine the control points. Then we iterate by changing control points until the curve is satisfactory. But the most important thing to keep in mind is that all the curves must be consistent and be able to blend harmoniously. We essentially have the framework for Telugu font ready. But a lot of coding remains. In our spare time we will work on it. Some issues still remain unresolved. We are not sure what we should do to support transliteration of Sanskrit in Telugu. That means adding a lot of subscripts, superscripts. ...

Our file structure is basically like that in CMR. We have parameter, base driver, codes and program (right now empty) files.

## 7   JTeX

Emma Pease (`emma@csli.stanford.edu`) mailed me on July 5 1988 with a correction about the availability of JTeX: a Tops-20 version of JTeX no longer exists on Turing since the old Turing machine itself no longer exists.

## 8   Greek

### 8.1   Hamilton Kelly

First of all, I apologize heartily for getting Brian's name wrong. The correct surname is 'Hamilton Kelly', not just 'Kelly' (it's been that way since 1638!). I, of all people, should understand about unusual names!

My report about Brian's work on Greek META-FONT characters was written at second hand, and he was astonished (and I hope pleased) when he came across a description of his Greek METAFONT work in *TUGboat*. This has spurred him into polishing up what he has done, and resubmitting it to the TeX archive at Aston. Explaining the genesis of his work, Brian says:

I wanted access to a Greek font to type my homework, since I am currently learning Modern Greek at an evening class (for general interest, and for holidays). What I did was to take the character definitions already used in the maths italic for the lower-case Greek letters, along with the upper-case ones, and the normal ROMANU which make up the Greek upper-case and put them into a new driver file; I then META-FONTed this with various parameter files such that they now had spacing defined, etc., for use as a normal textual font.

Brian completed this work before hearing of Silvio Levy's work at Princeton, but continues to use his own Greek since it does not require a DVI output program which can read fonts of 256 characters.[4]

Brian has now written a small macro package which eases considerably the selection of the Greek fonts; this is for use under LaTeX, and makes use of the \@addfontinfo macro to define the font changing commands such that they scale automatically with LaTeX's size-changing commands. He has also written a short paper, describing what he has generated, and his future directions. He has recently been refining the character programs, to make some of the letters more textual in appearance (for example, the alpha was very wide; fine for maths, but not in text).

**Terms of Availability**

Brian has sent both the above mentioned files to the Aston archive, together with the revised font files, where all the material will be freely available. An announcement giving details will have appeared in UKTeX by the time you read this.

## 9 Perso-Arabic

### 9.1 Goldberg

In early September Jacques Goldberg noted that there has been a lot of progress with the Arabic font. He hoped to have it out by the end of September, all being well. The font consists of:

1. A complete font of 29 characters each at 2 or 4 glyphs (position dependent, isolated, first, middle, last in word).

2. A preprocessor with customizable mapping of the basic 29 chars to a–z, A–Z areas of an ASCII keyboard, that will work out an intermediary file such that unmodified TeX plus a few macros does indeed correctly compose bidirectional texts. The preprocessor reassigns the correct glyph from the isolated form glyph depending on the position in word.

All this will continue to be made available free to the academic community.

No vowel marking scheduled at this time, but Jacques says he could do it if requested. It would be implemented just like the accents in normal TeX.

## 10 Georgia Tobin

### 10.1 Century Schoolbook: Liber

In *TUGboat* **9.2**, Georgia gave more information about the process of designing the Century Schoolbook typeface she has been working on.[5] The face is now christened Liber, and the article was printed in the new face, at a resolution of 300dpi.

## 11 Icelandic

### 11.1 Pind

In the 'Many Faces' article, I failed to mention that Jorgen Pind had written a full account of his work on Icelandic TeX which appeared in Don Hosek's TeXMaG, volume 2, issue 5.

## 12 Miscellaneous

### 12.1 Hosek Pica

Don Hosek (of "Output Devices" and TeXMaG fame) has created a CM Pica, using the METAFONT code of the typewriter style font, CMTT, of Computer Modern as his point of departure. CM Pica is more or less a 10cpi version of CMTT with heightened ascenders and x-height, similar to the Xerox1200 PICA font in appearance.

CM Pica is specially designed as a sop to University authorities, some publishers' editors and the like, who insist on having a typescript manuscript marked up in the traditional manner, i.e., with a squiggly line under bold characters, and underlining under characters which would be italicized in print.

To achieve this, Don created 'bold' and 'italic' fonts (CMPICAB.MF, CMPICATI.MF) in which each character includes an under-squiggle, or underline respectively. Don also modified the ligtable commands controlling begin and end quotes and also hyphens, so that ' ' and ' ' both become ", while

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[4]Bill Kaster of Personal TeX Inc., has recently produced a version (1.00t) of their Hewlett Packard LaserJet driver, PTI LASER/HP, which copes beautifully with Silvio's large font. I understand from Bill that their Apple LaserWriter driver, PTI LASER/PS, already has this capability.

[5]'Designing for Low-Res Devices', *TUGboat* **9.2** (1988), 126–128.

' and ' both become ' (the single straight quote symbol at code '015 in CMTT). Similarly, on output, '--' becomes '-' and '---' becomes '--'.

The upshot is that one can code up a document in normal TeX fashion and then, by setting the fonts to be Hosek's Pica, it will print out looking as though it had been typed, with 'italic' text underlined and 'bold' text under-squiggled, etc. Merely reset the fonts to CMR (or whatever) and it will be properly typeset with all the variety of fonts and refinement of punctuation of which TeX is capable.

## 12.2  Non-standard sizes of CM

John Sauter reported in *TUGboat* 7.3 (1986), 151–152, that he has re-parameterized CM so that any of the existing Computer Modern family may be created with any design size. For example, most of us, when requiring an 11pt CMR will use CMR10 at \magstep half. Apparently this is not satisfactory to the most discerning, and Sauter's algorithms permit one to generate a true CMR11 face. They go further, of course, and permit the generation of any of the CM faces in any (reasonable) point size. This is done by algorithms that interpolate or extrapolate from the values used by Knuth in the METAFONT parameter files for CM. If a standard value, such as 10pt, is chosen, then Sauter's algorithms will produce CM fonts identical to the standard ones. The TFM files for all sizes match exactly.

Don Hosek's TeXMaG, volume 2, number 4 gives further details of Sauter's work, and notes that some of the fonts may start looking bad at larger sizes, lacking inter-character space, and so on. Don has prepared a version of Sauter's work tailored for use on a PC, which is available from him. See the TeXMaG article for details.

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## Output Devices

### TeX Output Devices

Don Hosek

The device tables on the following pages list all the TeX device drivers currently known to TUG. Some of the drivers indicated in the tables are considered proprietary. Most are not on the standard distribution tapes; those drivers which are on the distribution tapes are indicated in the listing of sources below. To obtain information regarding an interface, if it is supposed to be included in a standard distribution, first try the appropriate site coordinator or distributor; otherwise request information directly from the sites listed.

The codes used in the charts are interpreted below, with a person's name given for a site when that information could be obtained and verified. If a contact's name appears in the current TUG membership list, only a phone number or network address is given. If the contact is not a current TUG member, the full address and its source are shown. When information on the drivers is available, it is included below.

Screen previewers for multi-user computers are listed in the section entitled "Screen Previewers". If a source has been listed previously under "Sources", then a reference is made to that section for names of contacts.

Corrections, updates, and new information for the list are welcome; send them to Don Hosek, Bitnet Dhosek@Hmcvax (postal address, page 229).

### Sources

**ACC**  Advanced Computer Communications, Diane Cast, 720 Santa Barbara Street, Santa Barbara, CA 93101, 805-963-9431 (DECUS, May '85)

**Adelaide**  Adelaide University, Australia

The programs listed under Adelaide have been submitted to the standard distributions for the appropriate computers. The PostScript driver permits inclusion of PostScript files in a TeX file. The driver is described in *TUGboat, Vol. 8, No. 1*.

**AMS**  American Mathematical Society, Barbara Beeton, 401-272-9500 Arpanet: BNB@Math.AMS.com

**Arbor**  ArborText, Inc., Bruce Baker, 313-996-3566, Arpanet: Bwb@Arbortext.Com

ArborText's software is proprietary and ranges in price from $150 to $3000. The drivers for PostScript printers, the HP LaserJet Plus, the QMS Lasergrafix, and Imagen printers are part of their DVILASER