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pseu-doword          pseu-do-word
quadrat-ics          qua-drat-ics
quasiequiv-a-lence   qua-si-equiv-a-lence
quasi-hy-ponor-mal   qua-si-hy-po-nor-mal
quasir-ad-i-cal      qua-si-rad-i-cal
quasiresid-ual       qua-si-resid-ual
qua-sis-mooth        qua-si-smooth
qua-sis-ta-tion-ary  qua-si-sta-tion-ary
qu-a-si-tri-an-gu-lar  qua-si-tri-an-gu-lar
re-ar-range-ment     re-arrange-ment
Rie-man-nian         Rie-mann-ian
schedul-ing          sched-ul-ing
Schrodinger          Schro-ding-er
Schwarzschild        Schwarz-schild
semidef-i-nite       semi-def-in-ite
semi-ho-mo-th-etic   semi-ho-mo-thet-ic
ser-vomech-a-nism    ser-vo-mech-anism
setup                set-up
solenoid             so-le-noid
spheroid             spher-oid
stochas-tic          sto-chas-tic
Stokess-che          Stokes-sche
sub-scriber          sub-scrib-er
summable             sum-ma-ble
tech-nis-che         tech-ni-sche
ther-moe-las-tic     ther-mo-elas-tic
times-tamp           time-stamp
ve-r-all-ge-mein-erte  ver-all-ge-mein-erte
Verteilun-gen        Ver-tei-lun-gen
vs-pace              vspace
Wahrschein-lichkeit-s-the-o-rie
                Wahr-schein-lich-keits-the-o-rie
waveg-uide           wave-guide
whitesided           white-sided
whites-pace          white-space
Yingy-ong Shuxue Jisuan
                Ying-yong Shu-xue Ji-suan
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Fonts

Notes on Typeface Protection

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Preamble

The main question of typeface protection is: "Is there anything there worth protecting?" To that the answer must certainly be: "Yes." Typeface designs are a form of artistic and intellectual property." To understand this better, it is helpful to look at who designs type, and what the task requires.

Who makes type designs?

Like other artistic forms, type is created by skilled artisans. They may be called type designers, lettering artists, punch-cutters, calligraphers, or related terms, depending on the milieu in which the designer works and the technology used for making the designs or for producing the type.

("Type designer" and "lettering artist" are self-explanatory terms. "Punch-cutter" refers to the traditional craft of cutting the master image of a typographic letter at the actual size on a blank of steel that is then used to make the matrix from which metal type is cast. Punch-cutting is an obsolete though not quite extinct craft. Seeking a link to the tradition, modern makers of digital type sometimes use the anachronistic term "digital punch-cutter". "Calligrapher" means literally "one who makes beautiful marks". The particular marks are usually hand-written letters, though calligraphers may design type, and type designers may do calligraphy.)

It usually takes about seven years of study and practice to become a competent type designer. This seems to be true whether one has a Ph.D. in computer science, a high-school diploma, or no academic degree. The skill is acquired through study of the visual forms and practice in making them. As with geometry, there is no royal road.

The designing of a typeface can require several months to several years. A family of typefaces of four different styles, say roman, italic, bold roman, and bold italic, is a major investment of time and effort. Most type designers work as individuals. A few work in partnership (Times Roman[R], Helvetica[R], and Lucida[R] were all, in different ways, the result of design collaboration). In Japan, the large character sets required for a

typeface containing Kanji, Katakana, and Hiragana induce designers to work in teams of several people.

Although comparisons with other media can only be approximate, a typeface family is an accomplishment on the order of a novel, a feature film screenplay, a computer language design and implementation, a major musical composition, a monumental sculpture, or other artistic or technical endeavors that consume a year or more of intensive creative effort. These other creative activities can be protected by copyright or other forms of intellectual property protection. It is reasonable to protect typefaces in the same way.

The problem of plagiarism

A lack of protection for typeface designs leads to plagiarism, piracy, and related deplorable activities. They are deplorable because they harm a broad range of people beyond the original designers of the type. First, most type plagiarisms are badly done. The plagiarists do not understand the nature of the designs they are imitating, are unwilling to spend the necessary time and effort to do good work, and consequently botch the job. They then try to fob off their junk on unsuspecting users (authors, editors, and readers). Without copyright, the original designer cannot require the reproducer of a type to do a good job of reproduction. Hence, type quality is degraded by unauthorized copying.

Secondly, without protection, designs may be freely imitated; the plagiarist robs the original designer of financial compensation for the work. This discourages creative designers from entering and working in the field. As the needs of typography change (on-line documents and laser printing are examples of technical and conceptual changes) new kinds of typefaces are required. Creative design in response to such needs cannot flourish without some kind of encouragement for the creators. In a capitalist society, the common method is property rights and profit. In a socialist (or, in the past, royalist) society, the state itself might employ type artists. France, as a monarchy and as a republic, has had occasional state sponsorship of typeface design over the past 400 years. The Soviet Union has sponsored the design of new typefaces, not only in the Cyrillic alphabet, but also in the other exotic scripts used by various national groups in the Soviet Union.

Those who would justify plagiarism often claim that the type artists do not usually receive a fair share of royalties anyway, since they have usually sold their designs to some large, exploitive corporation. It is true that type designers, like many artists, are often exploited by their "publishers", but plagiarism exacerbates the problem. Plagiarism deprives the designer of decent revenues because it diverts profits to those who merely copied the designs. Plagiarism gives the manufacturer yet another excuse to reduce the basic royalty or other fee paid for typeface designs; the theme song is that the market determines the value of the design and cheap rip-offs debase the value of a face. For those interested in the economic effects of piracy, it is clear that plagiarism of type designs ultimately hurts individual artists far more than it hurts impersonal corporations.

Kinds of protection for type

There are five main forms of protection for typefaces:
1. Trademark;
2. Copyright;
3. Patent;
4. Trade Secret;
5. Ethics

Trademark. A trademark protects the *name* of a typeface. In the U.S., most trademarks are registered with the U.S. Patent and Trademark Office. The R in a circle $^{(R)}$ after a trademark or tradename indicates U.S. registration. The similarly placed TM indicates that a trademark is claimed, even if not yet officially registered. However, a trademark may be achieved through use and practice, even without registration. Owners of trademarks maintain ownership by use of the trademark and by litigation to prevent infringement or unauthorized use of the trademark by others.

As a few examples of registered typeface trademarks, there are Times Roman (U.S. registration 417,439, October 30, 1945 to Eltra Corporation, now part of Allied); Helvetica (U.S. registration 825,989, March 21, 1967, also to Eltra-Allied), and Lucida (U.S. reg. 1,314,574 to Bigelow & Holmes). Most countries offer trademark registration and protection, and it is common for a typeface name to be registered in many countries. In some cases the registrant may be different than the originator. For example, The Times New Roman (Times Roman) was originally produced by the English Monotype Corporation. In England and Europe, most typographers consider the design to belong to Monotype, but the trademark was registered by Linotype (Eltra-Allied) in the U.S., as noted above.

Trademark protection does not protect the design, only the name. Therefore, a plagiarism of a design is usually christened with a pseudonym

which in some way resembles or suggests the original trademark, without actually infringing on it. Resemblance without infringement can be a fine distinction.

Some pseudonyms for Times Roman are: "English Times", "London", Press Roman, "Tms Rmn". Some for Helvetica are "Helios", "Geneva", "Megaron", "Triumvirate". So far, there seem to be none for Lucida. There are generic typeface classifications used by typographers and type historians to discuss styles, trends, and categories of design. Occasionally these apparently innocuous classification systems are employed by plagiarists to devise generic pseudonyms, such as "Swiss 721" for Helvetica, and "Dutch 801" for Times Roman. It is not certain whether this usage of a generic classification is more for clarification or for obfuscation. In general, the proper tradename is a better indicator of identity, quality, and provenance in typefaces than a generic name. Some people believe that the same is true for other commodities such as wine, where taste is important.

A trademark usually consists of both a proprietary and a generic part. For example, in the name "Lucida Bold Italic", "Lucida" is the proprietary trademark part and "Bold Italic" is the generic part. The generic word "type" is usually understood to be a part of the name, e.g. "Lucida Bold Italic type". Sometimes a firm will append its name or a trademarked abbreviation of it to the typeface name, to achieve a greater degree of proprietary content, e.g. "B&H Lucida Bold Italic".

A related matter is the use of the name of a type's designer. A firm that ethically licenses a typeface will often cite the name of the designer — e.g. Stanley Morison (with Victor Lardent) for Times Roman, Max Miedinger (with Edouard Hoffmann) for Helvetica, Charles Bigelow and Kris Holmes for Lucida. Although a person's name is not usually a registered trademark, there are common law restrictions on its use. The marketing of plagiarized type designs generally omits the names of the designers.

Although Trademark is an incomplete kind of protection, it is used effectively (within its limitations) to prevent the theft of type names. Certain traditional typeface names, usually the surnames of illustrious designers like Garamond, Caslon, Baskerville, Bodoni, and others have become generic names in the public domain. Trademark protection of such names requires the addition of some proprietary word(s), as with these hypothetical creations, "Acme New Garamond", or "Typoluxe Meta-Baskerville".

Copyright. Copyright of typefaces can be divided into two parts: copyright of the design itself; and copyright of the font in which the design is implemented. In the U.S., typeface designs are currently not covered by copyright. This is a result of reluctance by the copyright office to deal with a complex field; by lobbying against copyright by certain manufacturers whose profits were based on typeface plagiarism; by a reluctance of Congress to deal with the complex issues in the recent revision of the copyright law.

The reluctance of Americans to press for typeface copyright may have been influenced by a feeling that typeface plagiarism was good for U.S. high-tech businesses who were inventing new technologies for printing, and plagiarizing types of foreign origin (Europe and England). If the situation becomes reversed, and foreign competition (from Japan, Taiwan, and Korea) threatens to overcome American technological superiority in the laser printer industry, then American firms may do an about-face and seek the protection of typeface copyright to help protect the domestic printer industry. Such a trend may already be seen in the licensing of typeface trademarks by Adobe, Hewlett-Packard, IBM, Imagen, and Xerox in the U.S. laser printer industry.

In Germany, where typeface design has always been a significant part of the cultural heritage, and where typefounding has remained an important business, there are more than one kind of copyright-like protections for typefaces. Certain long-standing industrial design protection laws have been used to protect typeface designs in litigation over royalties and plagiarisms. Further, there is a recent law, the so-called "Schriftzeichengesetz" enacted in 1981, that specifically protects typeface designs. New designs are registered, as is done with copyright in most countries. This law only protects new, original designs. It is available to non-German designers and firms. Therefore, some type firms and designers routinely copyright new designs in West Germany. This gives a degree of protection for products marketed in Germany. Since multinational corporations may find it cheaper to license a design for world-wide use rather than deal with a special case in one country, the German law does encourage licensing on a broader scale than would initially seem to be the case.

France, like Germany, has ratified an international treaty for protection of typefaces. This 1973 Vienna treaty will become international law when four nations ratify it. So far, only France and West Germany have done so, and thus a design must be

protected separately in each country. Even when the treaty becomes law, it will take effect only in those countries that have ratified it. The treaty was principally the work of the late Charles Peignot, a French typefounder, and John Dreyfus, an English typographer and typographic scholar. Presently, typefaces may be registered for protection in France under a 19th century industrial design protection law.

In the U.S., there continues to be some movement for typeface design protection. A proposed bill that would protect the designs of useful articles, like type, has been in committee for a few years. It seems to be going nowhere.

Digital (as opposed to analog) fonts may be protected by copyright of digital data and of computer programs. It has been established that computer software is copyrightable. Therefore, software that embodies a typeface, e.g. a digital font, is presumably also protected. There is some objection to this kind of copyright, on the grounds that the ultimate output of the program or the result of the data (i.e. a typeface design) is not copyrightable. However, the current belief expressed by the National Commission on New Technological Use of Copyrighted Works is that software is copyrightable even if its function is to produce ultimately a non-copyrightable work. Hence, typefaces produced by Metafont or PostScript[R], two computer languages which represent fonts as programs, are presumably copyrightable. Typefaces represented as bit-map data, run-length codes, spline outlines, and other digital data formats, may also be copyrightable. Some firms do copyright digital fonts as digital data.

Note that the designs themselves are still not protected in the U.S. A plagiarist could print out large sized letters (say, one per page) on an Apple LaserWriter, using a copyrighted PostScript digital font, and then redigitize those letters by using a scanner or a font digitizing program and thus produce a new digital font without having copied the *program* or *digital data*, and thus without infringing the copyright on the font. The quality of the imitation font would usually be awful, but it wouldn't violate copyright. Of course, the plagiarist would usually need to rename the font to evade trademark infringement. [As I write these words, I have the guilty feeling that I have just provided a recipe for type rip-off, but others have obviously thought of just such a scheme — John Dvorak has even proposed something like it in one of his columns.]

Design Patent. The designs of typefaces may be patented in the U.S. under existing design patent law. Many designs are patented, but type designers generally don't like the patent process because it is slow, expensive, and uncertain. Nevertheless, some types do get patented, and it is a form of potential protection. Note that this is *Design* Patent — the typeface doesn't have to be a gizmo that does something, it merely has to be unlike any previous typeface. The drawback here is that most attorneys and judges are not aware that there are more than two or three typefaces: say, handwriting, printing, and maybe blackletter. Therefore, litigating against infringement is an educational as well as a legal process. It is easy to see that typeface theft is more subtle than knocking over a liquor store; it may not be illegal and the returns may be greater.

Protections like design patent are available in many other countries, but there is not an international standard (to my knowledge) so the situation must be examined on a country by country basis.

Invention Patent. Methods of rendering typefaces can be patented as mechanical or electronic inventions. For example, the old hot-metal Linotype machinery was protected by various patents, as was the IBM Selectric typewriter and type ball. IBM neglected to trademark the typeface names like Courier and Prestige, so once the patents had lapsed, the names gradually fell into the public domain without IBM doing anything about it (at the time, and for a dozen years or so, IBM was distracted by a major U.S. anti-trust suit). Most students of the type protection field believe that those names are probably unprotectable by now, though IBM could still presumably make a try for it if sufficiently motivated.

There is currently a noteworthy development regarding a patent for outline representation of digital type as arcs and vectors, with special hardware for decoding into rasters. This patent (U.S. 4,029,947, June 14, 1977; reissue 30,679, July 14, 1981) is usually called the Evans & Caswell patent, after its inventors. It was originally assigned to Rockwell, and in 1982, Rockwell sued Allied Linotype for infringement. Allied settled out of court, having paid an amount rumored to be in the millions. Rockwell sold the patent, along with other typographic technology, to Information International, Inc. (III), which then sued Compugraphic for infringement. According to the Seybold Report, a respected typographic industry journal, Compugraphic recently settled out of court for 5 million

dollars. Although many experts believe the patent to be invalid because of several prior inventions similar in concept, it nevertheless seems to be a money-maker in corporate litigation. The Seybold Report has speculated on which firms III would litigate against next. Among the candidates suggested by the Seybolds was Apple for its LaserWriter, which uses outline fonts. Since the entire laser printer industry and the typesetting industry is moving toward outline font representation, Apple is certainly not alone. The Seybolds further speculate on whether the difference between character-by-character CRT typesetting and raster-scan laser typesetting and printing would be legally significant in such a case. Ultimately, some firm will hold out for a court judgement, and the matter will be decided.

Trade Secret. Given that typeface designs have relatively little copyright protection in the U.S., they are often handled as trade secrets. The secret must apply to the digital data or programs only, because the images themselves are ultimately revealed to the public as printed forms. It is much more difficult to reconstruct the formula of Coca-Cola from its taste than it is to reconstruct the design of Helvetica from its look on the page. The exact bitmap or spline outline of a digital font is usually not reconstructable from the printed image, although CRT screen fonts at usual resolutions (60–120 dots per inch) may be reconstructed by patient counting and mapping of bits off a screen display. Typeface licenses often contain stipulations that the digital data will be encrypted and confidential. Just as a firm will protect the secret of a soft drink recipe, so a type firm will protect the exact nature of its digital data.

Ethics. Some typographers are motivated by higher principles than greed, profit, expediency, and personal interest. Idealists afflicted with concepts of ethical behavior and a vision of typography as a noble art may find it distasteful to use plagiarized types. Some graphic designers insist on using typefaces with bona-fide trademarks, both to ensure that the type will be of high quality, and to encourage creativity and ethics in the profession. A consequence of plagiarism that is sometimes overlooked is a general erosion of ethics in an industry. If it is okay to steal typeface designs, then it may be okay to purloin other kinds of data, to falsify one's resume, to misrepresent a product, and so forth. Most professional design organizations attempt to promote ethical standards of professional behavior,

and personal standards may extend to avoidance of plagiarism.

The Association Typographique Internationale (ATypI) is an international organization of type designers, type manufacturers, and letterform educators. Its purpose is to promote ethical behavior in the industry, advancement of typographic education, communication among designers, and other lofty aims. Members of ATypI agree to abide by a moral code that restricts plagiarism and other forms of depraved behavior (pertaining to typography). These are noble goals, but some members (especially corporate members) of ATypI, confronted with the pressures and opportunities of commercial reality, nevertheless plagiarize typefaces of fellow members, the moral code notwithstanding. Since ATypI is a voluntary organization, there is very little that can be done about most such plagiarism. Some years back, a world-famous type designer resigned from the ATypI Board of Directors in protest over the organization's flaccid attitude toward plagiarists among its ranks. He has since agreed to sit on the board again, but criticism of the organization's inability to prevent type rip-offs by its own members, not to mention by non-members, continues to be heard. Moderates in ATypI believe that a few morals are better than none. It is not clear whether their philosophical stance derives from Plato, Hobbes, or Rousseau.

Given the general attitude of users toward copyrighted video and software, it is doubtful that ethical considerations will hinder most end-users' attitude to plagiarized type fonts. A desire to have the fashionable "label" or trademark may be a greater motivation toward the use of bona-fide fonts than an ethical consideration.

Further reading

"The State of the Art in Typeface Design Protection", Edward Gottschall, *Visible Language*, Vol. XIX, No. 1, 1985 (a special issue on "The Computer and the Hand in Type Design" — proceedings of a conference held at Stanford University in August, 1983).

Der Schutz Typographischer Schriftzeichen, by Guenter Kelbel. Carl Heymans Verlag KG, Cologne, 1984. (A learned account, in juridical German prose, of the significance of the Vienna Treaty of 1973 and the West German Schriftzeichengesetz of 1981.)

Disclaimer

These notes were originally prepared at the request of Brian Reid, for informal distribution. They are based on the author's review of available literature on the subject of typeface protection, and on personal experience in registering types for trademark, copyright, and patent. However, they are not legal advice. If one is contemplating protecting or plagiarizing a typeface, and seeks legal opinion, it is advisable to consult an attorney. The term "plagiarize" (and words derived from it) is used here in its dictionary sense of "to take and use as one's own the ideas of another" and does not mean that the practice of typeface plagiarism is illegal, as that is determined by the laws of a particular country.

The author is a professor of digital typography as well as a professional designer of original digital typefaces for electronic printers and computer workstations. He therefore has an obvious bias toward the inculcation of ethical standards and the legal protection of artistic property. Other commentators might have a different perspective.

Building Computer Modern fonts

John Sauter

When **METAFONT** version 1.0 was released I eagerly obtained a copy, because I wanted to use the Computer Modern fonts on my DEC LN03. By experiment, and with some assistance from Professor Knuth, I determined the **METAFONT** device-dependent parameters for the LN03. The non-obvious parameters are: *blacker* 0.65, *fillin* −0.01, *o_correction* 0.5.

I then found that the process of building all of the font files on a VMS system, while straightforward, is not trivial. I have written some VMS command procedures which build the font files, and I would be happy to share them with the TEX community. They require about $2\frac{1}{2}$ days of CPU time on a VAX-11/785, so I would also be willing to share the results of this process.

Of course, I was not satisfied with just the 75 standard fonts in the standard 7 magnifications. I also wanted Computer Modern Symbols in 12-point, since I use 12-point a lot due to the low resolution of the LN03. In addition, I like to use Computer Modern Sans Serif for acronyms, but CMSS12 looks a little too large, so I wanted Computer Modern Sans Serif 11-point. I could have gotten these using magnified fonts, of course, but that doesn't seem right: I wanted fonts that were designed for the size in which I was using them. I expected to want more fonts than these someday, like a 20-point monospaced font, so I wanted a way to build non-standard Computer Modern fonts in a more-or-less automatic way.

My solution to this problem was to create alternative parameter files to produce the Computer Modern fonts. By ignoring point size I counted 31 Computer Modern font families: CMB, CMBSY, CMBX, CMBXSL, CMBXTI, CMCSC, CMDUNH, CMEX, CMFF, CMFI, CMFIB, CMINCH, CMITT, CMMI, CMMIB, CMR, CMSL, CMSLTT, CMSS, CMSSBX, CMSSDC, CMSSI, CMSSQ, CMSSQI, CMSY, CMTCSC, CMTEX, CMTI, CMTT, CMU and CMVTT. I created the corresponding 31 parameter files, each of which takes a point size as input. If you give the alternative parameter file a point size which corresponds to one of the standard Computer Modern fonts, it produces exactly the same results as the standard parameter file. If you give it a point size which does not correspond to a standard font, it interpolates or extrapolates each of the font parameters to produce what seems to me to be a reasonable value, based on all the standard values for that parameter in that font family. In font families in which only one point size is given, such as CMFF10, I couldn't do more than linear extrapolation. In most of the families, though, I was able to write an algorithm for each parameter which gave reasonable results for all point sizes between 5 and 100. Sometimes the formulae are quite complex, in order to exactly match the standard values at the standard point sizes.

Wherever possible I tried to use common files for similar calculations. For example, the upper case part of CMCSC10 is almost identical to CMR10, so I used a single file, COMPUTE_CMR, to compute the common parts of both. Thus, even though CMCSC is given only in 10-point, I can use the algorithms of CMR to give better values than I could have gotten through linear extrapolation. Similarly, CMSY is very similar to CMMI, so I can use the CMMI calculations to give a better CMSY12.

To guard against typographical error, I have used these alternative parameter files to create all of the standard point sizes and magnifications for the LN03, and compared them with the files produced by the standard parameter files. The .TFM files had to match exactly, or the fonts could not be called