



*Typographic perfection  
with OpenType?*

Adam Twardoch EuroTEX 2005

### 3 "No one will ever need more than 128 characters!" – ASCII

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
□	□	□	□	□	□	□	□	□			□	□		□	□
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
□	□	□	□	□	□	□	□	□	□	□	□				
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
p	q	r	s	t	u	v	w	x	y	z	{		}	~	□

## 4 “No one will ever need more than 128 characters”?

The quick brown fox jumps over  
the lazy dog. Zwei Boxkämpfer  
jagen Eva quer durch Sylt.

# 5 "No one will ever need more than ~~128~~ characters!"

256

80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
€		,	f	„	...	†	‡	^	%	Š	<	Œ		Ž	
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
	‘	’	“	”	•	—	—	~	™	š	>	œ		ž	ÿ
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
	i	ç	£	¤	¥	¦	§	¨	©	ª	«	¬	-	®	¯
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF
ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

# 6 Codepage soup: incompatible 8-bit encodings that only cover a subset of the necessary character set

80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
Ä	Å	Ç	É	Ñ	Ö	Ü	á	à	â	ä	ã	å	ç	é	è
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
ê	ë	í	ì	î	ï	ñ	ó	ò	ô	ö	õ	ú	ù	û	ü
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
†	°	¢	£	§	•	¶	ß	®	©	™	'	..	≠	Æ	Ø
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
∞	±	≤	≥	¥	μ	∂	Σ	Π	π	∫	ª	º	Ω	æ	ø
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
¿	¡	¬	√	ƒ	≈	Δ	«	»	...		À	Ã	Õ	Œ	œ
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
–	—	“	”	‘	’	÷	◇	ÿ	ÿ	/	◻	<	>	fi	fl
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
‡	·	,	„	%	Â	Ê	Á	Ë	È	Í	Î	Ï	Ì	Ó	Ô
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF
□	Ò	Ú	Û	Ü	ı	ˆ	˜	¯	˘	·	°	¸	”	¸	˘

## 7 Typesetting multilingual text has always been a challenge in GUI layout applications and in T<sub>E</sub>X

Pięć flakonów wody „Экземпляръ”.  
actual text

Pięć flakonów wody „Ÿęçłěďě·đú”.  
text encoded as Windows 1250 (Central European)

Рікж флаконуw wody „Экземпляръ”.  
text encoded as Windows 1251 (Cyrillic)

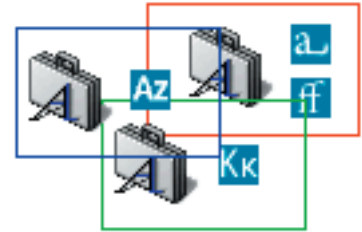
## 8 Typesetting multilingual text has always been a challenge in GUI layout applications and in T<sub>E</sub>X

§89. Zdanie, w którym występują wszystkie litery alfabetu, nazywamy pangramem. Autorem najstarszego polskiego pangramu „Pójdźże, kiń tę chmurność w głąb flaszki!” jest J. G. H. PAWLIKOWSKI. Autorem filigranowego quasi-pangramu „Książęcych spóźnień czułość” jest WALDEMAR PAŁASZ. Ogłosił on w 1998 roku konkurs na polskie pangramy



## 9 Different character groups stored in separate fonts, switching fonts often necessary

§89. Zdanie, w którym występują wszystkie litery alfabetu, nazywamy pangramem. Autorem najstarszego polskiego pangramu „Pójdźże, kiń tę chmurność w głąb **f**laszy!” jest **J. G. H. PAWLIKOWSKI**. Autorem **f**iligranowego quasi-pangramu „Książęcych spóźnień czułość” jest **WALDEMAR PAŁASZ**. Ogłosił on w **1998** roku konkurs na polskie pangramy



## 10 In GUI applications, switching fonts may lead to unwanted effects, in T<sub>E</sub>X ligature information stored in separate files (.tfm)

§89. Zdanie, w którym występują wszystkie litery alfabetu, nazywamy pangramem.

Autorem najstarszego polskiego pangramu „Pójdźże, kiń tę chmurność w głąb ☒ aszy!” je ☒ **j. g. h. pawlikowski**.

Autorem ☒ ligranowego quasi-pangramu „Książęcych spóźnień czułość” jest **waldemar pałasz**. Ogłosił on w **1998** roku konkurs na polskie pangramy i quasi-

# 11 Unicode assigns numeric codes to characters

a	→	97	0x0061
á	→	225	0x00E1
ą	→	261	0x0105
α	→	945	0x03B1
Я	→	1103	0x044F
Ń	→	1488	0x05D0
😊	→	9787	0x263B
練	→	32244	0x7DF4



# 13 The Unicode Standard encodes 100 000 characters, 1 million possible

029C	029D	029E	029F	02A0	02A1	02A2	02A3	02A4	02A5	02A6	02A7	02A8	02B0	02B1	02B2	02B3	02B4	02B5	02B6	02B7	02B8	02B9	02BA	02BB	02BC	02BD	02BE	02BF	02C0	02C1	02C2
н	і	ѣ	л	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ
02C3	02C4	02C5	02C6	02C7	02C8	02C9	02CA	02CB	02CC	02CD	02CE	02CF	02D0	02D1	02D2	02D3	02D4	02D5	02D6	02D7	02D8	02D9	02DA	02DB	02DC	02DD	02DE	02E0	02E1	02E2	02E3
>	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^	v	^
02E4	02E5	02E6	02E7	02E8	02E9	0300	0301	0302	0303	0304	0305	0306	0307	0308	0309	030A	030B	030C	030D	030E	030F	0310	0311	0312	0313	0314	0315	0316	0317	0318	0319
ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	
031A	031B	031C	031D	031E	031F	0320	0321	0322	0323	0324	0325	0326	0327	0328	0329	032A	032B	032C	032D	032E	032F	0330	0331	0332	0333	0334	0335	0336	0337	0338	0339
ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	
033A	033B	033C	033D	033E	033F	0340	0341	0342	0343	0344	0345	0360	0361	0374	0375	037A	037E	0384	0385	0386	0387	0388	0389	038A	038C	038E	038F	0390	0391	0392	0393
ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	ѣ	
0394	0395	0396	0397	0398	0399	039A	039B	039C	039D	039E	039F	03A0	03A1	03A3	03A4	03A5	03A6	03A7	03A8	03A9	03AA	03AB	03AC	03AD	03AE	03AF	03B0	03B1	03B2	03B3	03B4
Δ	Ε	Z	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	İ	ÿ	á	é	ή	í	ü	α	β	γ	δ
03B5	03B6	03B7	03B8	03B9	03BA	03BB	03BC	03BD	03BE	03BF	03C0	03C1	03C2	03C3	03C4	03C5	03C6	03C7	03C8	03C9	03CA	03CB	03CC	03CD	03CE	03D0	03D1	03D2	03D3	03D4	03D5
ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	ο	π	ρ	ς	σ	τ	υ	φ	χ	ψ	ω	ï	ÿ	ó	ú	ώ	β	θ	Υ	Υ	ÿ	φ
03D6	03DA	03DC	03DE	03E0	03E2	03E3	03E4	03E5	03E6	03E7	03E8	03E9	03EA	03EB	03EC	03ED	03EE	03EF	03F0	03F1	03F2	03F3	0401	0402	0403	0404	0405	0406	0407	0408	0409
ω	ς	ϕ	ϑ	ϗ	Ϙ	ϙ	Ϛ	ϛ	Ϝ	ϝ	Ϟ	ϟ	Ϡ	ϡ	Ϣ	ϣ	Ϥ	ϥ	Ϧ	ϧ	Ϩ	ϩ	Ϫ	ϫ	Ϭ	ϭ	Ϯ	ϯ	ϰ	ϱ	ϲ
040A	040B	040C	040E	040F	0410	0411	0412	0413	0414	0415	0416	0417	0418	0419	041A	041B	041C	041D	041E	041F	0420	0421	0422	0423	0424	0425	0426	0427	0428	0429	042A
Ъ	Ѣ	Ѐ	Ѥ	Ѧ	А	Б	В	Г	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ
042B	042C	042D	042E	042F	0430	0431	0432	0433	0434	0435	0436	0437	0438	0439	043A	043B	043C	043D	043E	043F	0440	0441	0442	0443	0444	0445	0446	0447	0448	0449	044A
Ы	Ь	Э	Ю	Я	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о	п	р	с	т	у	ф	х	ц	ч	ш	щ	ъ
044B	044C	044D	044E	044F	0451	0452	0453	0454	0455	0456	0457	0458	0459	045A	045B	045C	045E	045F	0460	0461	0462	0463	0464	0465	0466	0467	0468	0469	046A	046B	046C
ы	ь	э	ю	я	ё	ђ	ѓ	є	ѕ	і	ї	ј	љ	њ	ћ	ќ	ѣ	џ	Ѡ	ѡ	Ѣ	ѣ	Ѥ	ѥ	Ѧ	ѧ	Ѩ	ѩ	Ѫ	ѫ	Ѭ
046D	046E	046F	0470	0471	0472	0473	0474	0475	0476	0477	0478	0479	047A	047B	047C	047D	047E	047F	0480	0481	0482	0483	0484	0485	0486	0490	0491	0492	0493	0494	0495
Ѿ	ѿ	Ѱ	ѱ	Ѳ	ѳ	Ѵ	ѵ	Ѷ	ѷ	Ѹ	ѹ	Ѻ	ѻ	Ѽ	ѽ	Ѿ	ѿ	Ѱ	ѱ	Ѳ	ѳ	Ѵ	ѵ	Ѷ	ѷ	Ѹ	ѹ	Ѻ	ѻ	Ѽ	ѽ



# 15 Brief history of the Unicode Standard

- 1984 ISO working group created to define universal character set
- 1987 Unicode working group created to define universal character set (Apple, Xerox)
- 1990 Distinct Unicode 1.0 and DIS-1 10646 published
- 1991 “Two universal character sets? Not a good idea!”: Unicode and ISO 10646 merged
- 1993 Merged Unicode 1.1 and ISO 10646-1:1993 published
- 1996 Unicode 2.0 published, 38 885 encoded characters
- 1998 Unicode 2.1 published, adding e.g. the euro character
- 1999 Unicode 3.0 published, 49 194 encoded characters
- 2000 ISO/IEC 10646-1:2000 published (Unicode 3.0 equivalent)
- 2002 Unicode 3.2 published, 95 156 encoded characters (> 65 536!)
- 2003 Unicode 4.0 published, 96 513 encoded characters
- 2005 Unicode 4.1 beta, 97 786 encoded characters

# 16 Thirty years of digital outline font technology: 1975–2005

1975 Peter Karow announces Ikarus at the ATypI conference in Warsaw



1985 Adobe Systems creates the PostScript language and defines the PostScript *Type 1* font format (the specification is confidential)

1987 Apple Computer and Microsoft Corp start creating their own font format that would be independent from an Adobe license

1990 Adobe publishes the PostScript Type 1 specification



1991 Adobe publishes ATM, Apple and Microsoft publish the *TrueType* format

1993–96 Apple develops TrueType into *TrueType GX* (later: AAT), Microsoft develops TrueType into *TrueType Open*

1998 Adobe joins the Microsoft initiative and creates the *CFF* format that allows placing PostScript font data into the TrueType file structure

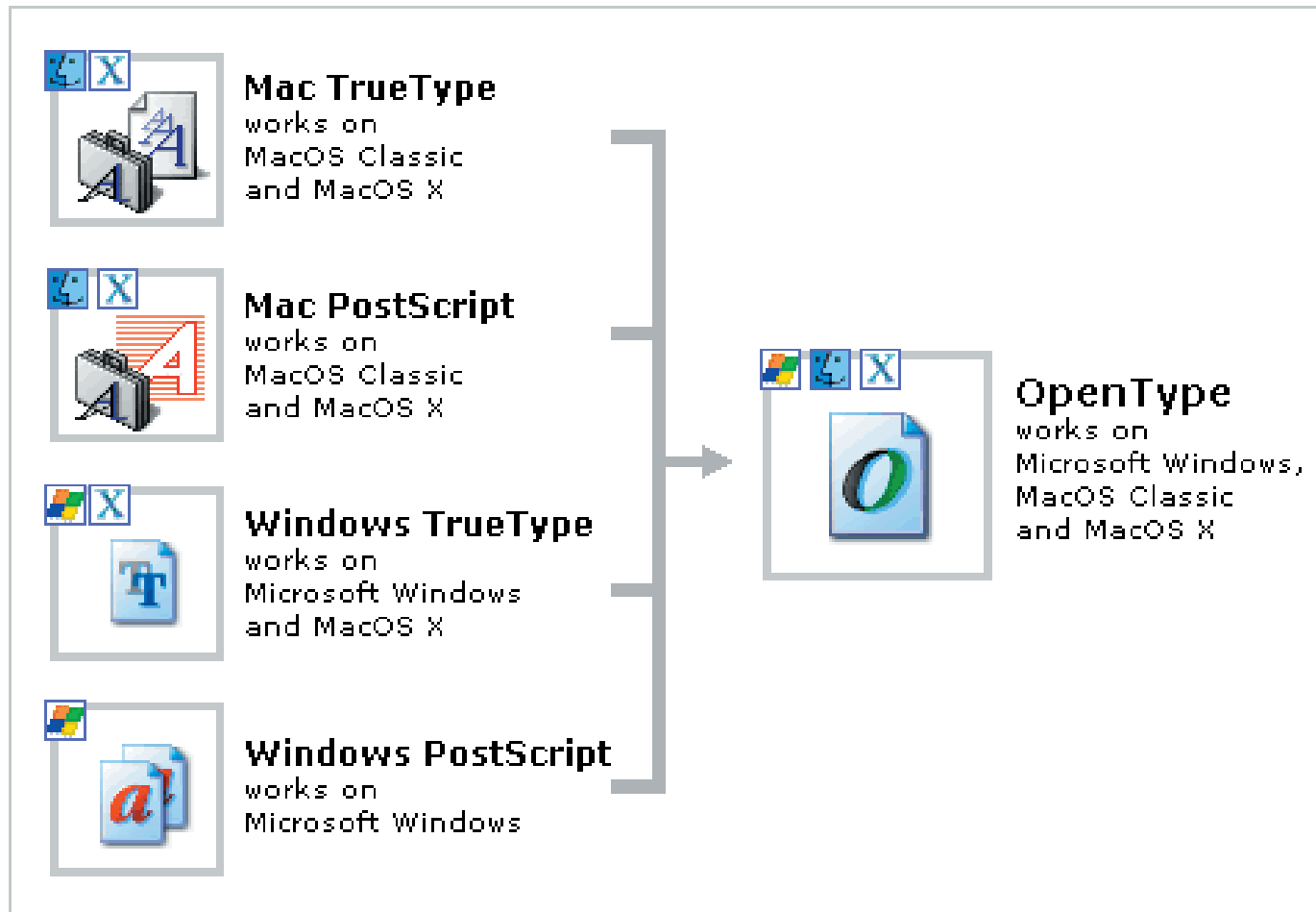
1999 Adobe and Microsoft announce *OpenType* based on TrueType Open and CFF



2000 First OpenType fonts published by Adobe and Microsoft



# 17 One format, many platforms: OpenType



# 18 One character, many glyphs

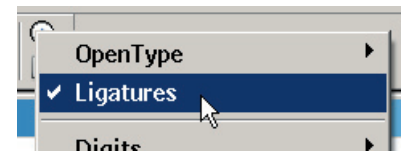
**a** → a a A **a** **a** a *a* *a* *a*



20 Brioso Pro (Robert Slimbach, Adobe Systems)  
Layout features: standard ligatures (liga)

JAN KOTT Jonasz Kofta  
JAN KOTT Jonasz Kofta

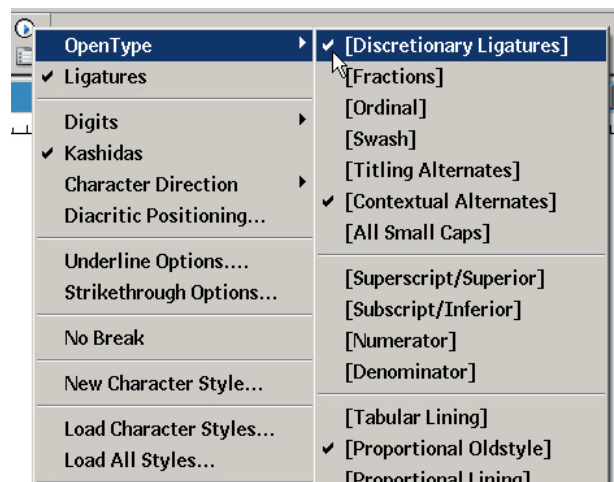
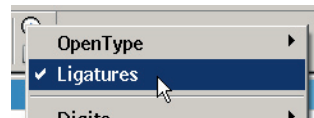
Thorgal fjord szufla firet motto  
Thorgal fjord szufla firet motto











# 21 Poetica Std (Robert Slimbach, Adobe Systems) Layout Features: liga, dlig, salt, ornm

*Wspaniali  
Jonasz Kości i Jan Koff*

*Historia  
Kabaretu Starszych  
Panów*



## 22 In the Arabic writing system, each letter has four different forms: isolated, initial, medial and final

	isol	init	medi	fina
t 062A				
h 062D				

## 23 The OpenType font contains appropriate layout features (init, medi, fina) that map the default form to the contextual forms

لحوق ← ل ح ق

tekst Unicode: 0x0020, 0x0642, 0x062D, 0x0644, 0x0020 → ل, lam, hah, qaf, ل

لحوق ← ل ح ق

procesor Uniscribe → ل, lam (init), hah (medi), qaf (fina), ل → ل, lam.init, hah.medi, qaf.fina,

# 24 Some languages have localized glyph forms in handwriting



Godło Polski.  
Godło Polski.

łódka



łyżwy



łóżko



łyżki



godło

g-o-d-ł-o

ł-L

g-o-d-ł-o

godło

godłō

g-o-d-ł̄-o

ł̄ - Ł̄

g-o-d-ł̄-o

godłō



25 OpenType allows for language-sensitive substitutions  
so for Polish language, the calligraphic Islash can be substituted

*Władystaw Jagiello*  
international forms

*Władystaw Jagiello*  
localized forms

*Władystaw Jagiello*  
ligatures

26 OpenType allows for language-sensitive substitutions  
so different glyph variants can be selected depending on language

Típográfica Félix

Półtawski Toruń

Típográfica Félix

Półtawski Toruń

# 27 OpenType fonts exist in two “flavors”: OpenType TT and OpenType PS



## TrueType

flexible and extensible,  
one disk file, Unicode



## PostScript Type 1

high quality outline definition,  
standard in prepress/publishing



## OpenType

combines advantages of TrueType  
and PostScript, adds new features











## OpenType TT (.ttf)

best suitable for  
corporate/office use  
where high screen quality  
and good multilingual  
support are critical —  
backwards-compatible  
with TrueType



## OpenType PS (.otf)

best suitable for  
prepress/publishing use  
where high outline quality,  
PostScript compatibility  
and typographic features  
are critical — not fully com-  
patible with old environments

	MacOS		Microsoft Windows	
	OpenType TT (.ttf)	OpenType PS (.otf)	OpenType TT (.ttf)	OpenType PS (.otf)
 <b>Microsoft Word</b> 2000, 2001, XP	Az	Az	Az UN	Az
 <b>Microsoft Word</b> 2003, X	Az	Az	Az UN	Az UN
 <b>Adobe InDesign</b> 1.0, 1.5, 2.0	Az UN O	Az UN O	Az UN O	Az UN O
 <b>Adobe Photoshop</b> 7.0	Az UN O	Az UN O	Az UN O	Az UN O
 <b>Adobe Illustrator</b> 10	Az UN	Az	Az UN	Az
 <b>Quark XPress</b> 4, 5	Az	Az	Az	Az
 <b>Macromedia Freehand</b> 10, MX	Az	Az	Az	Az
 <b>Corel Draw</b> 10, 11	Az UN	Az UN	Az UN	Az UN

**Az** basic Roman support   **UN** multilingual support   **O** advanced features support



*Zapfino*  
EXTRA

Calligraphic Typeface  
by Hermann Zapf  
Published  
in OpenType Format  
by Linotype Library

45 46 47 48 49 50 51 52 53 54 55 56  
The Goudy & Et Buz

57 58 59 60 61 62 63 64 65 66 67 68 69 70  
Uxesper Voex Orew

71 72 73 74 75 76 77 78 79 80 81  
Ebeç eò & Math's!

# 31 Originally published as a series of Type 1 fonts

◆ Zapfino One

A B C D E Q Z a b c d e f g x y z

◆ Zapfino Two

A B C D E Q Z a b c d e f g x y z

◆ Zapfino Three

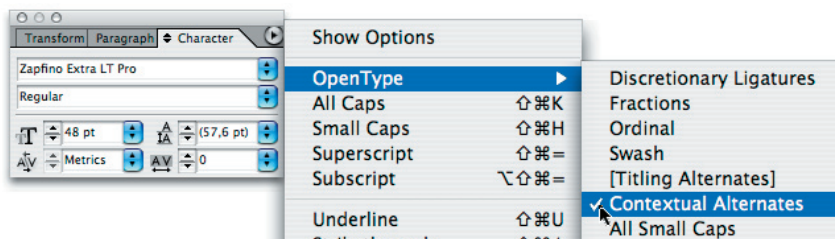
A B C D E Q Z a b c d e f g x y z

◆ Zapfino Four

A B C D E Q Z a b c d e f g x y z

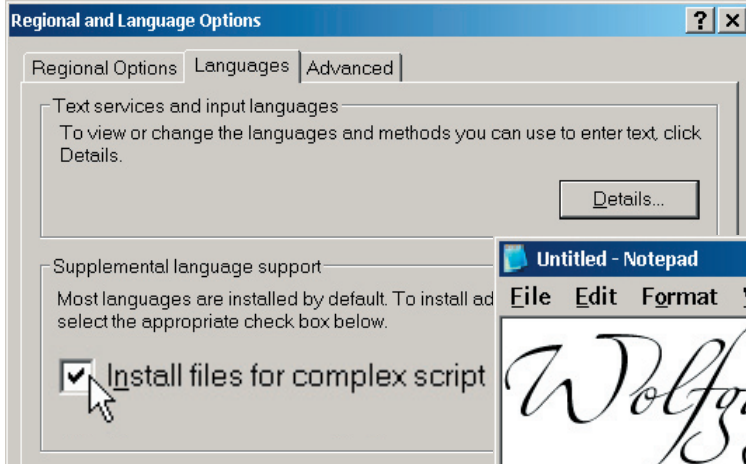
# 32 Zapfino Extra LT Pro contains an extensive set of contextual features that simulate calligraphic "randomness"

*cal* ▶ *calligr* ▶ *calligrap* ▶  
▶ *calligraph* ▶ *calligraphic*





# 33 Works on Windows XP SP-2 in many applications including Notepad, also Adobe InDesign, Illustrator CS, Photoshop CS, soon Mac OS X



34 Upcoming: Garamond Premier Pro  
A new typeface family by Robert Slimbach, Adobe Systems

A B C D E F G H I J K L M N O P Q R S T U V

a b c d e f g h i j k l m n o p q r s t u v w x y z

à á â ã ä å ä ā ą á ă â ã à ā ą ă ã ç fb fff fb ffl

а б в г д е ж з и й к л м н о п р с т у ф х ц ч ш щ ь ы ь э

α β γ δ ε ζ η θ ι κ λ μ ν ξ ο π ρ σ τ υ φ χ ψ ω ι ü ó ú ó ϑ ϕ ω

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

*Calligraphy is freehand*

A B C D E F G

*in which the freedom*

H I J K L M N

*is so reconciled with order*

O P Q R S T U

*that the understanding eye*

V W X Y Z

*is pleased to contemplate it.*

STANLEY MORISON

Formal and Freestyle Scripts

*Tools of the Trade*

A VARIETY OF INSTRUMENTS

*Myriad Arabesques*

**Vernacular of their Time**

*Humanistic Book Hands*

Professionals and Amateurs

*Window to the Past*





INCOMMUNICABLE



SANCTITY

MAJESTIC

THE TEMPERED LIGHT OF THE WOODS IS LIKE A  
PERPETUAL MORNING • AND IS STIMULATING AND  
HEROIC • THE ANCIENTLY REPORTED SPELLS OF

STIMULATING

TEMPERED

PERPETUAL

# SILENTIUM PRO, ROMAN I GLYPHS

Basic Latin Glyphs

ABCDEFGHIJKLMNOPQRSTUVWXYZ &  
1234567890abcdefghijklmnopqrstuvwxyz  
1234567890

Inline Capitals

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789

Reversed Box Capitals

**A B C D E E F G G H I J K L M M N O P Q R R**  
**S T U V W X Y Z**

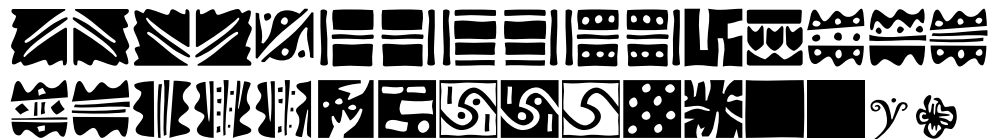
Additional Glyphs

Æ Œ Đ Þ Q R æ œ ð ÿ ß þ ð v f i l f f f f i f f l f j f f j (¼ ½ ¾)

% ‰ ‹ › / °) [ ¤ ] { £ € ¥ ¢ # \$ ¢ } <sup>1234</sup> <sub>1234</sub>

! ? ; ¸ ℓ e ð Π Σ μ π √ ∞ ∫ ^ ÷ × + − ± < > ~ ≈ ≠ ≥ ≤ ◇ § † ‡ ¶ \*

• ◦ ◂ ◃ ◅ ◆ ◇ ◈ ◉ ◊ ◌ ◍ ◎ ● ◐ ◑ ◒ ◓ ◔ ◕ ◖ ◗ ◘ ◙ ◚ ◛ ◜ ◝ ◞ ◟ ◠ ◡ ◢ ◣ ◤ ◥ ◦ ◧ ◨ ◩ ◪ ◫ ◬ ◭ ◮ ◯ ◰ ◱ ◲ ◳ ◴ ◵ ◶ ◷ ◸ ◹ ◺ ◻ ◼ ◽ ◾ ◿



À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã





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**Adam Twardoch**  
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