International unification of typographic measurements

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The Osterwald table on p.129 was reproduced by Funnell, Dyson & Gregory Ltd.

The history of efforts to standardize systems of typographic mensuration shares many features with the development of standardization in other industrial fields. In the early stages there was the same deliberate adherence to arbitrary sizes as a competitive weapon; there is, in general, a natural inertia and resistance to change, alongside genuine technical problems; and there are the problems of creating and properly using an administrative framework for developing and implementing new standards. In addition certain features specific to the printing industry appear to militate against a wholehearted transition from a craft-orientated to an engineering mode of thinking.

The earliest attempts to standardize body sizes appear to have been made at the Imprimerie Royale, in connexion with Grandjean's work on the Romain du Roi; Grandjean's first specimens are numbered after a method very close to the point system.[1] It was not, however, until Pierre Simon Fournier started his own foundry that type of systematically related body sizes became commercially available. A long history leads from there to Firmin Didot's attempt in 1811 to introduce a 'millimetric typography'. How his assignment for the Imprimerie Nationale came to an abrupt end, and with it the historic chance to do away with the irrational conflict between the system of mensuration used by the printer in the composing room and the system which he uses in all other departments and in the rest of his life, has been extensively covered. It is not proposed here to give yet another summary of the 150 years of intermittent attempts, theoretical and practical, to achieve full accordance of the type system with the metric system. This was done in an address to the First International Congress of ICOGRADA in 1964,[2] and historical surveys with bibliographical references are contained in papers by Stork,[3] Grabau,[4] Tracy,[5] and others. Nor is it proposed to point again to the cost, nationally and in terms of international trade, of the present state of affairs, nor to concentrate on the factual side of the developments since the ICOGRADA project for international unification of typographic measurements was launched in 1964. The technical and trade press in various countries covered these aspects.[6]

Didot's logic

Firmin Didot who, together with his father, had carried the day in establishing a larger typographical point than Fournier's, after a short lapse of time himself proposed the abolition of the point that bore his name. The size of the earlier Didot point (0·376 mm) was exactly the 864th part of the *pied du roi*: 6 points to a *ligne*, 12 *lignes* to a *pouce*, 12 *pouces* to a *pied*. There was none of the arbitrariness of the later American point which immediately came under criticism as 'capriciously and unscientifically selected, not based on any regular fraction of the foot or metre' and which owed its subsequent general acceptance to an extraordinarily rapid concentration of capital in the founding industry (with one group of foundries eventually controlling 85% of the country's total output). Nor was there any of the half measure that had allowed Fournier to take over the names but not the dimensions of the official standard system of mensuration. Didot's rejection of the earlier Didot point and his proposal to replace it by a point of 0·4 mm was not a change of mind: it was the reflection in a logical mind of the replacement of the *pied du roi* by the metre. With the impetus of the French Revolution spent, and without the support of Napoleon, Didot could but witness the victory of his earlier point, which he knew had lost its *raison d'être*.

The historical context

The prospects of any standardization project depend not merely on its intrinsic merits, but also on the historical context. Logically, little has changed since Didot drew his conclusions from the adoption of the metric system, or since Updike wrote that 'until a type system is formulated which is in full and regular accordance with the metric system, perfection will not be attained',[7] or since Stork, on behalf of the Dutch Federation of Master Printers, advocated a consistently metric typography at the Eighth International Master Printers' Congress in Venice in 1954.[8] Technologically, however, the printing industry has changed to such an extent that not acting logically has become absurd. In Tracy's words,[5] 'adherence to a system of type measurement formulated in the eighteenth century is hardly realistic'. The cost, both of retaining the *status quo* and of the eventual rationalization, increases the longer rationalization is delayed. In 1961 Tracy[5] based his proposals for an 80 point to the inch system explicitly on 'the absence of any official move in Britain and the United States towards the metric system in industry'. Although the extrapolation into the future could have been faulted, and the trend toward the general adoption of the metric system throughout the world foreseen at that time, Tracy's proposal was perfectly logical, on the basis of his premise, as a means of relating the typographic system of mensuration to the primary system in common use.

Two developments have significantly changed the historical situation and therefore the chances for success of the ICOGRADA project, since Duncan referred to 'the enormous expansion in data processing for business, military, and scientific purposes'. The money poured into these developments, he wrote, 'has gone to create new printing devices outside and unconnected with the traditional industry; devices created by scientists and engineers who either haven't heard of, or choose to ignore, pica ems and points, and prefer centimetres and inches'.[8] One development was the International Computer Type-setting Conference in 1964 in London, which heralded the coming to terms of the traditional printing industry with the new advances in printing technology. The other was the demand made by the Federation of British Industries in February 1965 for the general adoption of the metric system throughout British industry as the primary system of measurement, and the subsequent commitment by the British Government to a phased ten-year changeover from 24 May 1965. The United States Senate also authorized, in 1965, a feasibility study on the metric system.[9] In 1964 it could still be envisaged that the lead in progress toward universal acceptance of a millimetric typography would continue to lie with pioneers in metric countries; the adoption of the metric system in Britain, and even more so in the United States, was seen in long-term perspective, and typometric progress in these countries therefore appeared to be a particularly thorny problem. Although the British Standards Institution considered it 'vital that industry in the United Kingdom should play a full part in determining international agreements on all metric standards, even though the move in the particular sector of United Kingdom industry concerned is not imminent'[10] the step from such international co-operation to actual implementation appeared almost forbiddingly great. The perspective now appears reversed: the British printing industry, along with the rest of British industry, is committed to dimensional reorientation. Against that background the climate has certainly changed in respect of natural inertia: there is less resistance to a reappraisal of any real justification for using incompatible systems of mensuration within one industry. Consultations between the British

Federation of Master Printers and ICOGRADA, formal support for the ICOGRADA project at Association level (such as Birmingham), and the formation of BSI panel S/–/2 (typographic measurement), are among the manifestations of this change in climate. It is not unreasonable to envisage that the British printing industry might take dimensional reorganization to its logical conclusion and thus take the lead in typometric progress. Such a lead might even pay off in terms of future exports.

Capital investment and technical problems

Tracy[5] named the composing machine and photo-composition as the two factors that leave the printer 'not necessarily as much in bondage to traditional measurement as he was before the introduction of mechanical composition'. Even in publishing, the investment in standing matter no longer plays the part it played a few years ago; where the production of successive editions, with or without changes in format and typographic specification, can originate from one and the same tape, there is no longer any truly technical or capital investment consideration against departing from the traditional point systems. Taking the industry as a whole, the weight of capital investment has shifted toward areas to which the traditional point systems are altogether irrelevant, or where continued adherence to them does not have its roots in technical necessity. With the terms of early metal founding artificially imposed upon the thinking in new fields of printing technology, such thinking lags behind even the technical development of metal founding itself. There is a case for defining which fields of the printing industry are already working to metric standards (it is significant that the Lumitype, for instance, works on a 'metric point' or 0·25 mm with line-to-line distance adjustable in increments of 0·025 mm); which fields can most easily and rapidly effect the changeover because there are no major technical problems involved, but immediate benefits could accrue (for example, from using identical measurements in the making-up of text and pictorial material); and which fields have specific problems of existing equipment that has to go on being used over a given cycle of years before it falls due for renewal. Only from such an examination can a realistic pattern of phasing emerge.

On the foundry side of the industry, whereas any new type-designs can be produced to new metric sizes, the foremost short-term consideration for all existing designs is, of course, the continued use of existing punches and matrices. The implications of this for the choice of the basic increment of size will be discussed below. More serious problems of capital costs are involved for founders' type where rigid moulds do not have the flexibility as to body size which characterizes mechanical casting equipment. International standardization on the other hand, particularly of height to paper[11] will do away with the necessity for multiple stock keeping.

The adjustments required to composing machines are comparatively simpler. In the two German printing houses that went over to a metric system in their composing rooms in 1954[12] and 1956[13] respectively, Linotype and Monotype equipment was involved, and both firms had the full co-operation of the manufacturers. The necessary adjustments to the equipment, and the cost of these, have been described in detail by Schöning.[14] The original series of body sizes at Osterwald in Hanover included several multiples of 0·375 mm, which were later superseded by consistently decimal sizes as shown on page 129. When the GEG Druckerei in Hamburg went metric in 1956 it began on a consistently decimal basis, with 0·375 mm for rules and leads as the only concession.[13] A comparison of the two printing houses and a discussion of practical problems of changing over before metric material is generally obtainable – transitional problems like those of the combined use of metric and traditional material and the limited acceptance of overhangs– were made by Grabau.[4]

Basic increment and series of preferred sizes

The systems proposed and in some cases implemented ranged from the Meterkonkordanz (equating 48 Didot points with 18 mm) to proposals of metric points of varying dimensions (⅓ mm, 0·4 mm, 0·5 mm). The main ground for criticizing the 0·3 mm proposal was that dimensions with recurring decimals are unsuitable for precision engineering. (The same point was made by Tracy[5] in respect of division by 6, 12, and 72.) Didot's point of 0·4 mm, chosen at a time when the duodecimal mode of calculation was the generally prevailing one and the metre had only just been introduced, has been described as a compromise between a consistently decimal and the traditional duodecimal basis of calculation. Since the official decision of Britain to go metric, however, Tracy has

opposite page:
One side of the table introduced at Osterwald for the use in the composing room as well as by print buyers. The table shows all values resulting from multiplication or division of values in the horizontal and vertical line respectively framed by rules. (The reversed line at the head shows the approximate relation to Didot sizes – this was particularly important in relation to standing Didot matter.)
Examples: for use of the table for multiplication or division:
(1) 48 lines of body size 3·75 mm (10 pt Didot) equals 180 mm.
(2) The dimension for, say, 42 Didot points is found in line 42, column 3·75: it is 157·5 mm.
(3) A column of, say, 168 mm depth made up of 3·5 mm lines, shows 48 lines.

put the case for the point of 0·4 mm again in 1966.[15] Stork and Schöning reject the need for a separate typographic 'point' and advocate the straightforward description of sizes of type, furniture, etc. in millimetric terms.

To decide for or against a separate, though metric, typographic point, three main aspects need consideration: (1) the development of methods of character generation more flexible than metal founding; (2) the problem of the basic increment and of a series of preferred multiples, and the issue of a consistently decimal approach; and (3) psychological and/or technical aspects in which the printing industry might differ from other industries. Tracy[5] drew attention to the possible effect of more flexible methods of character generation and hinted at the possibility of entirely departing from the traditional point system by envisaging that 'it may be, then, that the most effective system of type measurement in the future may have to be devised on principles quite different from those inherent in the systems discussed in this article. What can be said now is that the Didot and American point systems, useful as they have been for so many years, need no longer be regarded as the essential and only systems possible.'

To consider the problem from the *general* aspect of character generation, and then analyse the *special* place of metal founding in that context, is better than starting with the special aspects of metal and imposing its limitations on the rest of the industry. The flexibility of photo-composition,[16] as regards the size of reproduction of a predetermined set of characters, is not limited in the way that metal founding is limited. Computer-controlled, electronic character generation reduces the limitations of the predetermined character image. The potential effect on the control that can be exercised over visual type size is even more far-reaching. The unsatisfactoriness of describing type of widely varying visual size by reference to identical body sizes focused attention on 'visual size'. Zachrisson[17] defined it as '*x*-height measured in mm multiplied by the mean width of the letters'. Hoch and Goldring[18] proposed a system of dimensional references providing a framework allowing varying degrees of approximation. References, for example, to specific processes such as metal founding do not enter except in that context; on the other hand, variations in ascender height, accents, etc.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$2^{2}/_{3}$	4	6	$6^{2}/_{3}$	8	$9^{1}/_{3}$	10	12	$13^{1}/_{3}$	16	20	24	$26^{2}/_{3}$
Millimeter	**0^{25}**	**0^{375}**	**0^{5}**	**0^{75}**	**1**	**1^{5}**	**2^{25}**	**2^{5}**	**3**	**3^{5}**	**3^{75}**	**4^{5}**	**5**	**6**	**7^{5}**	**9**	**10**
	0^{25}	0^{375}	0^{5}	0^{75}	1	1^{5}	2^{25}	2^{5}	3	3^{5}	3^{75}	4^{5}	5	6	7^{5}	9	10
	0^{5}	0^{75}	1	1^{5}	2	3	4^{5}	5	6	7	7^{5}	9	10	12	15	18	20
	0^{75}	1^{125}	1^{5}	2^{25}	3	4^{5}	6^{75}	7^{5}	9	10^{5}	11^{25}	13^{5}	15	18	22^{5}	27	30
	1	1^{5}	2	3	4	6	9	10	12	14	15	18	20	24	30	36	40
	1^{25}	1^{875}	2^{5}	3^{75}	5	7^{5}	11^{25}	12^{5}	15	17^{5}	18^{75}	22^{5}	25	30	37^{5}	45	50
	1^{5}	2^{25}	3	4^{5}	6	9	13^{5}	15	18	21	22^{5}	27	30	36	45	54	60
	1^{75}	2^{625}	3^{5}	5^{25}	7	10^{5}	15^{75}	17^{5}	21	24^{5}	26^{25}	31^{5}	35	42	52^{5}	63	70
	2	3	4	6	8	12	18	20	24	28	30	36	40	48	60	72	80
	2^{25}	3^{375}	4^{5}	6^{75}	9	13^{5}	20^{25}	22^{5}	27	31^{5}	33^{75}	40^{5}	45	54	67^{5}	81	90
	2^{5}	**3^{75}**	**5**	**7^{5}**	**10**	**15**	**22^{5}**	**25**	**30**	**35**	**37^{5}**	**45**	**50**	**60**	**75**	**90**	**100**
	2^{75}	4^{125}	5^{5}	8^{25}	11	16^{5}	24^{75}	27^{5}	33	38^{5}	41^{25}	49^{5}	55	66	82^{5}	99	110
	3	4^{5}	6	9	12	18	27	30	36	42	45	54	60	72	90	108	120
	3^{25}	4^{875}	6^{5}	9^{75}	13	19^{5}	29^{25}	32^{5}	39	45^{5}	48^{75}	58^{5}	65	78	97^{5}	117	130
	3^{5}	5^{25}	7	10^{5}	14	21	31^{5}	35	42	49	52^{5}	63	70	84	105	126	140
	3^{75}	5^{625}	7^{5}	11^{25}	15	22^{5}	33^{75}	37^{5}	45	52^{5}	56^{25}	67^{5}	75	90	112^{5}	135	150
	4	6	8	12	16	24	36	40	48	56	60	72	80	96	120	144	160
	4^{25}	6^{375}	8^{5}	12^{75}	17	25^{5}	38^{25}	42^{5}	51	59^{5}	63^{75}	76^{5}	85	102	127^{5}	153	170
	4^{5}	6^{75}	9	13^{5}	18	27	40^{5}	45	54	63	67^{5}	81	90	108	135	162	180
	4^{75}	7^{125}	9^{5}	14^{25}	19	28^{5}	42^{75}	47^{5}	57	66^{5}	71^{25}	85^{5}	95	114	142^{5}	171	190
	5	**7^{5}**	**10**	**15**	**20**	**30**	**45**	**50**	**60**	**70**	**75**	**90**	**100**	**120**	**150**	**180**	**200**
	5^{25}	7^{875}	10^{5}	15^{75}	21	31^{5}	47^{25}	52^{5}	63	73^{5}	78^{75}	94^{5}	105	126	157^{5}	189	210
	5^{5}	8^{25}	11	16^{5}	22	33	49^{5}	55	66	77	82^{5}	99	110	132	165	198	220
	5^{75}	8^{625}	11^{5}	17^{25}	23	34^{5}	51^{75}	57^{5}	69	80^{5}	86^{25}	103^{5}	115	138	172^{5}	207	230
	6	9	12	18	24	36	54	60	72	84	90	108	120	144	180	216	240
	6^{25}	9^{375}	12^{5}	18^{75}	25	37^{5}	56^{25}	62^{5}	75	87^{5}	93^{75}	112^{5}	125	150	187^{5}	225	250
	6^{5}	9^{75}	13	19^{5}	26	39	58^{5}	65	78	91	97^{5}	117	130	156	195	234	260
	6^{75}	10^{125}	13^{5}	20^{25}	27	40^{5}	60^{75}	67^{5}	81	94^{5}	101^{25}	121^{5}	135	162	202^{5}	243	270
	7	10^{5}	14	21	28	42	63	70	84	98	105	126	140	168	210	252	280
	7^{25}	10^{875}	14^{5}	21^{75}	29	43^{5}	65^{25}	72^{5}	87	101^{5}	108^{75}	130^{5}	145	174	217^{5}	261	290
	7^{5}	**11^{25}**	**15**	**22^{5}**	**30**	**45**	**67^{5}**	**75**	**90**	**105**	**112^{5}**	**135**	**150**	**180**	**225**	**270**	**300**
	7^{75}	11^{625}	15^{5}	23^{25}	31	46^{5}	69^{75}	77^{5}	93	108^{5}	116^{25}	139^{5}	155	186	232^{5}	279	310
	8	12	16	24	32	48	72	80	96	112	120	144	160	192	240	288	320
	8^{25}	12^{375}	16^{5}	24^{75}	33	49^{5}	74^{25}	82^{5}	99	115^{5}	123^{75}	148^{5}	165	198	247^{5}	297	330
	8^{5}	12^{75}	17	25^{5}	34	51	76^{5}	85	102	119	127^{5}	153	170	204	255	306	340
	8^{75}	13^{125}	17^{5}	26^{25}	35	52^{5}	78^{75}	87^{5}	105	122^{5}	131^{25}	157^{5}	175	210	262^{5}	315	350
	9	13^{5}	18	27	36	54	81	90	108	126	135	162	180	216	270	324	360
	9^{25}	13^{875}	18^{5}	27^{75}	37	55^{5}	83^{25}	92^{5}	111	129^{5}	138^{75}	166^{5}	185	222	277^{5}	333	370
	9^{5}	14^{25}	19	28^{5}	38	57	85^{5}	95	114	133	142^{5}	171	190	228	285	342	380
	9^{75}	14^{625}	19^{5}	29^{25}	39	58^{5}	87^{75}	97^{5}	117	136^{5}	146^{25}	175^{5}	195	234	292^{5}	351	390
	10	**15**	**20**	**30**	**40**	**60**	**90**	**100**	**120**	**140**	**150**	**180**	**200**	**240**	**300**	**360**	**400**
	10^{25}	15^{375}	20^{5}	30^{75}	41	61^{5}	92^{25}	102^{5}	123	143^{5}	153^{75}	184^{5}	205	246	307^{5}	369	410
	10^{5}	15^{75}	21	31^{5}	42	63	94^{5}	105	126	147	157^{5}	189	210	252	315	378	420
	10^{75}	16^{125}	21^{5}	32^{25}	43	64^{5}	96^{75}	107^{5}	129	150^{5}	161^{25}	193^{5}	215	258	322^{5}	387	430
	11	16^{5}	22	33	44	66	99	110	132	154	165	198	220	264	330	396	440
	11^{25}	16^{875}	22^{5}	33^{75}	45	67^{5}	101^{25}	112^{5}	135	157^{5}	168^{75}	202^{5}	225	270	337^{5}	405	450
	11^{5}	17^{25}	23	34^{5}	46	69	103^{5}	115	138	161	172^{5}	207	230	276	345	414	460
	11^{75}	17^{625}	23^{5}	35^{25}	47	70^{5}	105^{75}	117^{5}	141	164^{5}	176^{25}	211^{5}	235	282	352^{5}	423	470
	12	18	24	36	48	72	108	120	144	168	180	216	240	288	360	432	480
	12^{25}	18^{375}	24^{5}	36^{75}	49	73^{5}	110^{25}	122^{5}	147	171^{5}	183^{75}	220^{5}	245	294	367^{5}	441	490
	12^{5}	**18^{75}**	**25**	**37^{5}**	**50**	**75**	**112^{5}**	**125**	**150**	**175**	**187^{5}**	**225**	**250**	**300**	**375**	**450**	**500**

Diese Berechnungstafel enthält alle Zahlenwerte, die durch Multiplikation im Schnittpunkt der roten waagerechten Zahlenreihe mit der senkrechten roten Zahlenreihe von 1-50 auf dieser Seite und von 51-100 auf der Rückseite entstehen. Die Zahlen in der schwarzen Leiste am Kopf zeigen das ungefähre Verhältnis in Didotpunkten zu den darunter stehenden roten Millimeterzahlen. 1 Didotpunkt = 0,376 mm. Einige Berechnungsbeispiele umseitig.

Comparison of body sizes: Didot system and various millimetric systems reproduced from J. Grabau[4]

Didot point	mm value	Meter-konkordanz	Beckert	Kolbinger	Hickethier	Werther	Schöning	Stork	Osterwald	GEG-Druckerei
0·5	0·188	—	0·25	0·25	—	0·25	0·25	0·25	0·25	—
1	0·376	0·375	—	—	—	0·375	0·375	—	0·375	0·375
1·5	0·564	—	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5
2	0·752	0·75	0·75	—	—	0·75	0·75	0·75	0·75	0·75
3	1·128	1·125	1·0	1·0	1·0	1·125	1·0	1·0	1·0	1·0
4	1·504	1·5	1·5	1·5	1·5	1·5	1·5	1·5	1·5	1·5
5	1·880	1·875	—	—	—	1·875	—	2·0	—	2·0
6	2·256	2·25	2·0	2·0	2·0	2·25	2·25	2·5	(2·25) 2·0*	2·5
7	2·632	2·625	2·5	2·5	2·5	2·625	(2·625)	—	— 2·5*	—
8	3·008	3·0	3·0	3·0	3·0	3·0	3·0	3·0	3·0	3·0
9	3·384	3·375	3·5	—	—	3·375	(3·375)	3·5	— 3·5*	—
10	3·760	3·75	4·0	3·5	3·5	3·75	3·75	4·0	(3·75) 4·0*	3·5
11	4·136	4·125	—	—	—	—	—	—	—	—
12	4·512	4·5	4·5	4·0	4·0	4·5	4·5	4·5	4·5	4·0
14	5·264	5·25	5·0	5·0	5·0	5·25	5·25	5·0	5·0	5·0
16	6·016	6·0	6·0	6·0	6·0	6·0	6·0	6·0	6·0	6·0
20	7·520	7·5	7·5	7·5	8·0	7·5	7·5	7·5	7·5	7·5
24	9·024	9·0	9·0	9·0	—	9·0	9·0	10·0	9·0	—
28	10·528	10·5	10·0	10·0	10·0	10·5	10·5	10·0	10·0	10·0
32	12·032	12·0	12·0	12·0	12·0	12·0	—	—	—	—
36	13·536	13·5	15·0	15·0	15·0	13·5	13·5	12·5	(13·5) 12·5*	12·5
48	18·048	18·0	18·0	18·0	18·0	18·0	18·0	15/17·5	(18·0) 15·0*	15·0
60	22·560	22·5	—	20·0	20·0	22·5	22·5	20/22·5	(22·0) 20·0*	20·0
72	27·072	27·0	—	—	—	—	27·0	25/27·5	—	—
84	31·584	31·5	—	30·0	30·0	—	31·5	—	—	—
96	36·096	36·0	—	40·0	—	—	36·0	—	—	—

The sizes shown in parentheses were later cast on the next smaller or larger body.
The sizes shown with asterisks replaced those shown in parentheses.

can be numerically expressed: taking incidence of each element in different languages into account, the relevant dimensions may be referred to or omitted.

The second aspect concerns, to begin with, the size of the basic increment. Merely to express incompatible series of sizes in metric terms would neither lead to the economies resulting from the use of a single system of mensuration throughout the industry, nor do anything to eliminate the many wasteful features in training, in estimating, or in printer-customer relations (such as the waste of skilled manpower in print-buying functions highlighted by Turner).[19] Most proponents of any form of metric typographic measurement aimed at an easy conversion between typographic and common metric dimensions. The simpler the conversion, the more readily can the compositor's measurements be understood by everybody concerned, in other departments as well as by the customer; the less objective need there is for a separately named unit such as the 'point'.

Given agreement on the size of the basic increment, there remains the question of the series of preferred multiples. Although photo-composition is in theory infinitely variable as to size, a series of preferred sizes is of course necessary on technical grounds; it does not follow, however, that the duodecimal basis of the point systems must be taken over. An unbiased look at the body sizes actually produced today reveals that trade between Didot and American point areas and the need for greater utilization of space in newspaper and magazine production have led to the introduction of so many half and quarter point steps, that the series of commercially available body sizes cannot be called duodecimal. Consideration of the Renard series of preferred numbers[20] brings out the very requirement that led, in the first place, to the standardization of body sizes in the form of the point systems: the need that all sizes should be multiples of a basic unit so that the larger ones can be made up of varying combinations of the smaller ones. For practical purposes, it would appear that an arithmetical series is required and not a geometrical one such as the Renard series. Reverting to the actual size of the basic increment, the question of multiples and sub-multiples is decisive for ease of calculation. An evaluation of the two principal contenders for acceptance as the ultimate universal standard is required: 0·4 mm (as proposed by Didot in 1811 and by Tracy in 1966) and 0·5 mm or 0·25 mm (as proposed by the majority of writers since the last war, and introduced in a few printing houses on the Continent, and for individual machines such as the Lumitype). Tracy[15] asks, as the first criterion, whether the system 'fractions' conveniently, and underlines the superiority of 0·4 mm as the basic unit in that, first, the arithmetical factors are not only the decimal ones of 2, 5, 10, but the familiar and useful 4, and secondly, that 'normal calculations never require more than one place of decimals'. The alternative increment of 0·5 mm, whether sub-divided into 0·25 mm or conceived as a basic unit of 0·25 mm, involves two places of decimals. The reasons advanced in its favour are that in its multiples it is consistently decimal – large units of length, for rules, leads, furniture, automatically increase in multiples of 5 or 10 mm; and Stork[3] points out that $2\frac{1}{2}$ fits into the decimal system so well that it cannot, in practical everyday terms, be considered a common fraction; to the factors by which 10 is divisible, one should therefore add $2\frac{1}{2}$ and its reciprocal value of 4. The ultimate choice, accordingly, appears to be between the advantages of restricting the number of places of decimals to one but retaining the need for conversion (albeit a simple conversion), and accepting two places of decimals but calculating in a consistently decimal mode, thus eliminating the need for any conversion.

The problem of transitional systems

Tracy's[15] second criterion, the continued use of punches, matrices, and so on, differs from the first in kind: it is sectional, that is it applies exclusively to metal founding and it is, by comparison with the first, short-term. The choice here must depend on which basic increment, with its multiples and sub-multiples, allows the greater range of existing punches and matrices to be accommodated without adjustment, or with only minor adjustment. In the context of metal founding, the American and Didot point areas have a different dimensional starting point, in any case. As in addition, and cutting across the geographical division, different sections of the industry do not face identical problems in moving toward a metric typographic standard, the interesting theoretical issue arises of envisaging variations between transitional systems. All standardization problems are dynamic, not static phenomena. The conflict between the overriding long-term requirement for a unified international metric standard, and the equally overriding short-term one for the utmost utilization of existing punches, matrices and other items may well find expression not only in differences in the phasing of the changeover in different sections of the industry, but in the adoption of differing transitional systems. The theoretical problem (with very practical implications) is how to ensure that any typometric systems adopted do ultimately lead to, and do not hamper, the adoption of an internationally acceptable metric standard. In other words, sectional and short-term decisions should be consciously conceived as steps toward an ultimate universal standard.

Is a typographic 'point' necessary at all?
A special name for the typographic unit is, as we have seen, objectively needed only to the extent that any conversion is required. The question, then, is whether there are technical or psychological aspects in which the printing industry characteristically differs from other modern industries. Typefounding has been a precision engineering operation for a long time; it does not work to points but measures dimensions in inches or millimetres to several places of decimals. The same applies to printing machinery manufacture. In no other branch of engineering are simple quantities expressed in anything but decimal fractions of the basic unit of mensuration. Special names are given, in certain instances, to derived units such as newton ($N = kg\ m/s^2$) for a unit of force, henry ($H = V\ s/A$) for a unit of inductance, or lux ($lx = 1\ m/m^2$) for a unit of illumination. In each case the special name serves as an abbreviated reference to a derived unit which needs special definition and which would otherwise be described by complex names.[21] This situation just does not apply in typographic measurement.

The absence of any technical justification for a special name for the typographic unit of length does not, however, preclude its limited usefulness on psychological grounds. An interesting study could be made of the 'black art' aspects of printing, and how these have strengthened reluctance to give up a system of mensuration that sets its user apart from the ordinary human being. Without going into implications such as these, there is an obvious transitional value of habit and familiarity. After all, even half a century after the firm establishment of the point system in Britain, there are still craftsmen thinking and calculating in 'numples' and similar terms. There can be no serious objection to basic typographic units being referred to as 'points' provided two interrelated conditions are fulfilled: (1) that the unit conveniently, though not necessarily, called a 'point' is a regular sub-division of the millimetre, and (2) that the units which different manufacturers or different countries choose to refer to as 'points' are simply related, if not identical.

This last eventuality can of course be ruled out. It would be naïve to expect international agreement on a standard before many years have passed; but the likelihood is great that unco-ordinated christening of varying metric increments as 'points' will proliferate in the meantime. No great harm need flow from this, so long as all those 'metric points' are regular decimal sub-divisions of the millimetre. We thus arrive at the paradoxical conclusion that the adoption of 0·5 mm or 0·25 mm as the basic increment which eliminates the objective need for a specially named typographic unit, at the same time leaves the greatest scope for the retention, on grounds of familiarity or convenience, of such a special name.

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