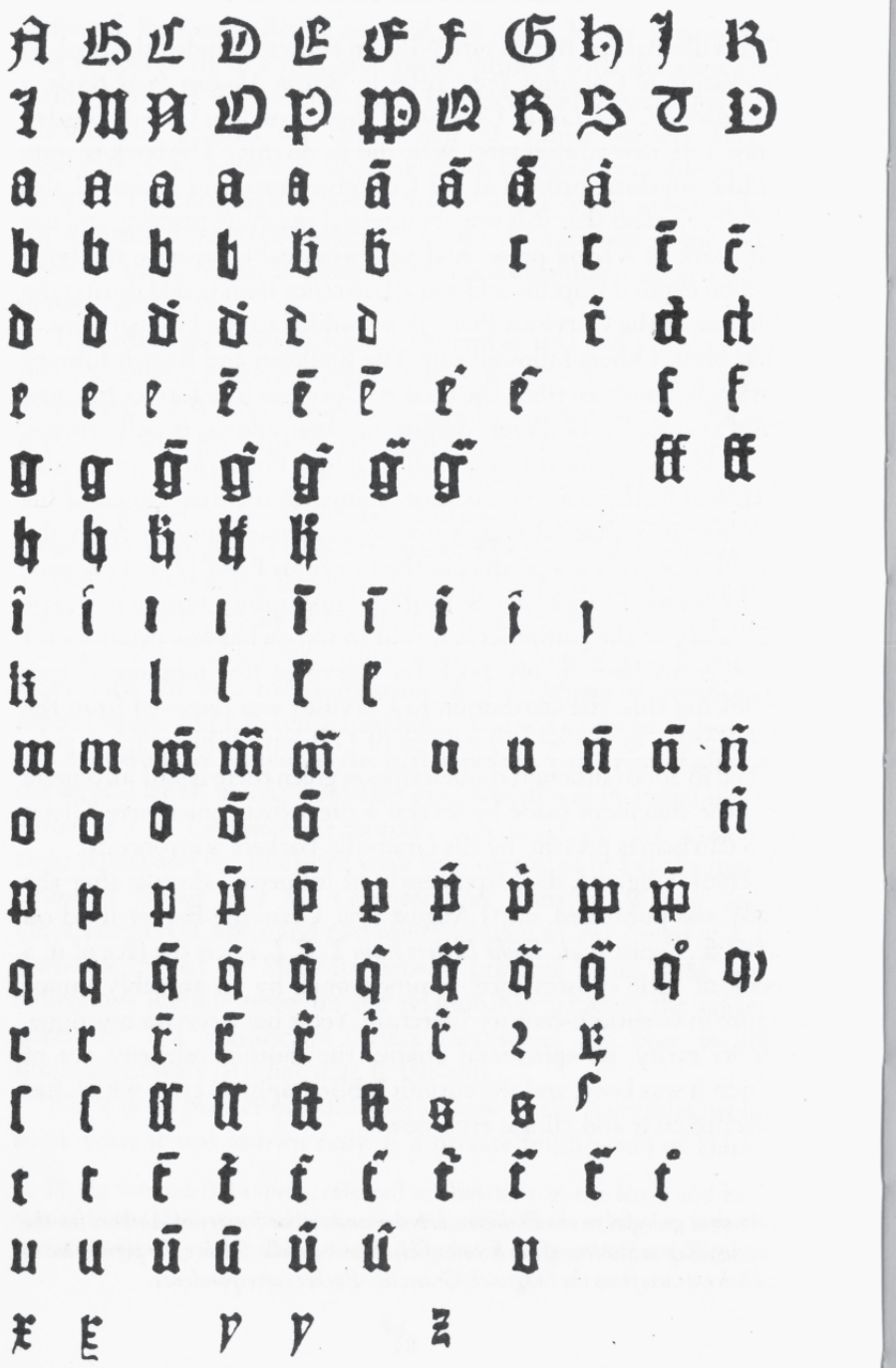

THE 'FIRST' TYPE OF Gutenberg

A Note on Recent Research

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A GOOD DEAL OF INTEREST has been generated recently by research at the Scheide Library at Princeton into the possible methods used by Johann Gutenberg to manufacture his first printing types (see my editorial in the Autumn 2000 issue). Some of the findings of this research, which has been undertaken by Paul Needham and Blaise Agüera y Arcas, have recently been published by Agüera y Arcas as 'Temporary Matrices and Elemental Punches in Gutenberg's DK Type' in a collection of essays, *Incunabula and their Readers* (edited by Kristian Jensen, British Library, 2003, pp. 1–12). This is an interesting collection of essays, and one which deserves scholarly attention to all its parts. But, in some ways regrettably, it is Agüera y Arcas's contribution which is likely to be the most often read and discussed section of the book. There is a fascination, almost an obsession, with the earliest printing technology, and any suggestion that we should look again at the way in which early printing types were made induces reactions ranging from delight, through scepticism to horror, sometimes out of all proportion to the true import of any new evidence. Many have discussed in the public bar, in print or pixels, the 'discoveries' made at Scheide and few printers, printing historians and armchair pundits have been able to resist the temptation to add their two-penn'orth. I am no exception, and it seems worth first summarising the evidence published by Agüera y Arcas, then looking at the conclusions that he and Paul Needham have drawn.

Agüera y Arcas's article presents some fascinating data, but it was clouded (to my mind) by his use of arcane mathematical terminology to describe the process of scrutinising and analysing the typeface

Opposite: 1. A partial synopsis of the DK fount, reproduced from Gottfried Zedler's *Die Älteste Gutenberg-Type* (Mainz, 1902)

used to print a Latin 'Bulla thurcor[um]' (bull of Calixtus III) calling for a crusade against the Turks. There is some uncertainty about the date of this bull. Agüera y Arcas says it was issued on 29 June 1456, while Albert Kapr (in *Johann Gutenberg: the Man and his Invention* (translated by Douglas Martin, Scolar Press, 1996)) dates the bull to a year earlier, and says that it calls for the crusade to begin on 1 May 1456. As far as I can see, the printed bull is actually dated 'duodecimo kalend[as] Julii' 1456, which I make 20 June 1456 by modern reckoning.[1] Happily, for our purposes, the precise dating of the *Bulla* is unimportant, and it is enough to know that it was printed around 1456. The only known copy of the Latin edition is held by the Scheide Library, although there is also a parallel German-language edition, held by the Staatsbibliothek at Berlin, described and reproduced by Albert Kapr.[2] The type in question is the so-called 'Donatus und Kalender' or DK fount (figure 1), which is believed to be Gutenberg's first, or first successful, type, earlier than that used to print the 42-line Bible of 1454–1455. The crudity of DK, and its appearance in certain undated, but evidently early, fragments, certainly suggest that the fount is of early manufacture, although the precise dating remains to be proven. The Latin *Bulla* was examined with a high-resolution scanning camera, and the individual characters catalogued and compared; similar work was done on selected pages of the 36-line Bible of around 1460 (dated here to 1461, although this dating too is uncertain, 1461 being the year in which

1. The Latin edition of the bull appears to conclude 'Dat[u]m rome ap[u]d s[an]ctu[m] petru[m] Anno in | carnacois [i.e. incarnationis?] d[om]inice Millesimo Quadri | gentesimo l sexto duodecimo kalend[as] Julii pontificat[us?] n[ost]ri Anno secundo', and the German edition 'Gegeben zu Rome | by sant peter In dem iare noch goddes | geburt Dusent vier hundert lui des | xij kalend Julij Pontificatus nostri | Anno secundo'. My translation of both would be 'Given in Rome at Saint Peter's in the year of our Lord's incarnation one thousand four hundred and fifty-six, on the twelfth kalend of July, in the second year of our pontificate'. Thus the year must be 1456, I think, both because of the date given and because Calixtus was elected Pope in April 1455, and was not into his second year until April 1456.

2. Both editions are included in facsimile in Research Publications Microfiche (1991), Incunabula, Unit 1.

the rubrication of a particular copy was completed; Kapr suggests a date for the Bible of 1457/1458). This Bible is the last substantial work known to have been set using the DK type. Agüera y Arcas is sensibly cautious in presenting the results of these examinations. However, what emerges, but is never stated explicitly in all the writer's careful circumlocutions, is that the DK fount is remarkable in that each piece of type in it is unique (i.e. no two examples of the same letter of the alphabet were cast from the same matrix).

Around 1456 there was enough of the type to compose only two or three pages of the *Bulla*, and the same identical character recurs 'typically approximately every four pages'. Agüera y Arcas does not state the format of the *Bulla*, but it is in fact a small quarto consisting of twelve leaves (the last two blank), the opening page being reproduced at slightly less than full size on page 3 of his essay. There are roughly 500 characters on each page so that, at a very rough estimate, the fount must have contained no more than around 2,000 individual pieces of type – probably nearer 1,500 – each one unique (how this affected the printing of the folio 36-line Bible is hard to assess; the fount had evidently been enlarged by the late 1450s, and Kapr describes it as 'newly cast', although there may still have been insufficient type to set more than one or two pages at a time).

If the results of the Scheide research are accurate, the pieces of type in the DK fount could not have been produced by the conventional method of cutting a steel punch, striking it into a piece of copper to form a matrix, inserting the matrix into an adjustable mould and casting near-identical pieces of type using an alloy of lead and other metals (usually tin and antimony). Such a procedure would produce a fount in which all the examples of each character were very similar, although variations can be caused by poor casting and later damage, and can be evident in printed texts because of variations in ink, paper and other printing conditions.[3] There is evidence to suggest that this holy trinity of punch, matrix and mould existed by the 1470s, and many earlier types display the sort of uniformity generated by the trinity.

3. See Stephen Pratt's 'The Myth of Identical Types' in *Journal of the Printing Historical Society* (new series 6, Summer 2003, pp. 7–17).

Agüera y Arcas says that if the types were made of metal 'there is a near-certainty that they were made by casting', and suggests that they were cast either using temporary matrices which were destroyed each time they were used, or from a large number of matrices used in parallel. This last suggestion does not convince however since, if this were the case, one would still expect to find characters cast from the same matrix to appear on the same page of a book from time to time (and, as I understand it, this never happens in the *Bulla*). Thus we are left with temporary matrices made, Agüera y Arcas proposes, from lead, sand, clay, plaster, *papier maché* or some similarly soft and ephemeral material. How likely is this? Let us imagine Gutenberg, or someone like him, attempting to cast a fount in this way. If he used a lead matrix, this could quite easily be made to survive through several (perhaps many) castings, and we would end up with some near-identical characters; this is also true of some of the other substances suggested, but if we accept that the matrix was destroyed, as a sand or paper matrix is likely to have been, how long would it have taken a clever man to realise that the process could be made much more efficient by changing his ephemeral matrix for one of a more durable material? Would he cast a thousand or two thousand characters by this long-winded method without succeeding in making his matrix last for more than one casting? Perhaps he would, but it seems unlikely.

Then there is the question of the punches. Even if we accept that each matrix had to be remade for each character to be cast, the characters would still be very similar if the matrix were struck from a metal punch of conventional form. Agüera y Arcas's suggestion is that there was not a separate punch for each letter, but a series of 'elemental' punches for different parts of the letter. One can immediately appreciate the sense and practical appeal of this idea. The inventor would have to cut only a few uprights, cross-bars, diagonal strokes, curved members, serifs, dots, accents and so forth, rather than complete alphabets of upper and lower case, plus diphthongs, ligatures, numerals and punctuation marks. (This seems such a sensible plan that someone must have tried it at some point during the history of typefounding, although I know of no evidence

of the practice in Western typography[4] – the great difficulty, of course, would be to strike each elemental punch to the same depth). If some soft medium were used for the matrix, then such elemental punches need not be of steel, but could be carved from a softer metal, or from wood or some other material. The idea of elemental punches is an intriguing and plausible one, although I am not convinced of its truth in relation to the DK fount, and some of the evidence presented by Agüera y Arcas argues against this possibility. He looks especially at the lower-case 'i's in the *Bulla*, which exhibit a wide range of variation, and concludes that each different i-body appears to have its own unique accent, dot or suspension stroke above. If there were elemental punches, one would expect each accent to appear above different bodies, and each body to appear with different accents, unless the inventor had imposed upon himself the curious discipline of using each pair, or group, of punches only together and not recombining them. This would rather defeat the object of having elemental punches. The kind of variations observed could be found if the punches were very ephemeral, lasting only for a few strikes, or a single strike, and needing to be recut at frequent intervals. This too is possible, but seems tremendously wasteful, and our imaginary technician would quickly have realised that his job could be simplified by making more durable punches.

My own two-penn'orth (perhaps worth even less) is as follows. In the first place, we should not be in the least surprised that the invention of moveable type was not a single event in which steel punch, brass matrix and adjustable mould emerged together from the process of imagining how identical characters might be generated for the purposes of printing. The evidence gathered by Paul Needham and Blaise Agüera y Arcas needs careful analysis, and we will not be certain of its detail, accuracy and significance until the findings of their study of the DK type are published in full. If we assume, *pro tempore*, that they are right and that the DK type is a fount in which every character is unique, my own feeling is that the explanation suggested in Agüera y Arcas's article is probably wrong.

4. Something similar was attempted with Chinese types in the nineteenth century. See *Journal of the Printing Historical Society* (27, 1998, pp. 115, 118).

He mentions the possibility that the fount was not cast at all, but that each character was carved individually in wood, going on to say that while this 'cannot be absolutely ruled out ... this possibility seems unlikely from a practical point of view'; the carving of each sort in metal is thought even more unlikely, as the work involved would be greater than with wood. It seems to me, however, that this fount is rather more likely to have been carved in wood or metal than to have been cast in some sort of temporary mould with a matrix struck from elemental punches. Let us imagine our inventor once more, sitting in his bath in Mainz and looking at a woodcut (like the famous one in figure 2, perhaps, which is apparently dated 1423).[5] It might have been a woodcut he had printed himself, or one he had seen printed, and he knew how such prints were generated. It bears a text, as well as an image. Supposing that text could somehow be cut up into its constituent letters. Then, provided they were of uniform dimensions in every way except laterally, these letters could be recombined in any order and a new print taken. If one had enough such letters a whole page could be formed. And thus, by printing one – or even more – pages at a time, the text of a complete manuscript could be copied, repeatedly, without anyone having to sit down and write the damned thing out. All that was necessary was to think of some way of making such a collection of individual letters. Extrapolating from the woodcut, would not the first, most obvious idea be to cut each letter on the end of a short stick of wood, trimmed to a standard size? The notion of cutting on a piece of metal, possibly cast in a simple mould of standard dimensions, would be a natural extension of this idea, all the more natural for a metalworker like Gutenberg or one of his collaborators (Johann Fust is thought to have been a goldsmith, and Peter Schoeffer was also an artisan and probably Gutenberg's assistant or apprentice before 1455). The difficulty of carving such a fount may have suggested that there was an easier way to proceed, and led to the

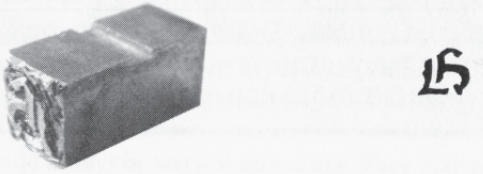
5. One should always be wary of such dates. They may not be the date of manufacture of the item, but have some other significance, being perhaps a year celebrated or commemorated, or the year in which a text was written or an image drawn. And there is always the possibility of an error.

2. Hand-coloured woodcut of Saint Christopher, apparently dated 1423

invention, by a process of trial and error, of the punch/matrix/mould model (indeed the carving of individual characters might lead the mind directly towards the idea of carving punches). But the difficulty of the carving would not necessarily have prevented our craftsman from attempting the task, and should not deter us from considering the possibility that this was done. The artisan who carved such a fount would have in mind, as he laboured for many weeks or months with delicate tools, the end of obtaining a fount which could be used to save an immensity of scribal labour in the longer term. Type was created in this way in the orient for centuries before printing was invented in Europe (see figure 3), and such a carved fount – in wood or metal – would produce all the curious variations observed by Needham and Agüera y Arcas.

3. A piece of carved wooden Chinese type (slightly enlarged) and an impression taken from it (actual size)

How practical is such a method? As a crude experiment I tried to carve a piece of type, using wood-engraving tools and a 24-point em-quadrat of modern Monotype type-metal. I chose to copy one of the upper-case 'B's from the DK-fount, as seen in the word 'Bulla'. The process took me twenty minutes. It was not difficult, though the results (figure 4) make my cack-handedness very evident.



4. A sort carved in Monotype type-metal (slightly enlarged) and an impression taken from it (actual size)

There are numerous ways in which this experiment might not compare with the carving of types in the mid-fifteenth century – the tools and type-metal are no doubt quite different, and the facility of the carver is certainly not that of a skilled metalworker. But it may be worth extrapolating from the results. At this rate of working, sitting at my bench for seven hours a day, six days a week, I could produce a fount of 2,000 sorts in around four months. If we accept the greater speed of a skilled artisan, and the relative ease of cutting many of the lower-case letters against the difficulty of an upper-case 'B', and weigh this against the probable greater hardness of the metal used and the possible unsuitability of the tools available, it seems likely that a fifteenth-century goldsmith would complete the same task no more slowly. And, of course, 1,500 sorts would take him still less time to carve.

There are other possible explanations for the observations made at Scheide and the truth may, in the end, be found in a quite different direction. One could imagine a sort of 'drawing' method of making type, in which a temporary matrix was created in some soft substance, such as *papier maché* or plaster, using a fine stylus wielded by a scribe. The matrix would then be left to dry and was capable of producing, in a simple mould, only a few, or a single, casting of type. One major difficulty of this solution would be of making the printing surface of the cast type smooth and uniform, but one could conceive of a method to achieve this involving the careful grinding flat of each character after casting.

The efforts of Needham and Agüera y Arcas to find a solution to their mystery that involves casting are perhaps driven in part by the enduring notion that Gutenberg's great invention was precisely this – type-*casting*. Indeed, it very probably was. But there is no reason why he should not have begun with a conceptually simpler, but physically more demanding, solution. It is interesting that there is in Agüera y Arcas's article no mention of previous discoveries, spoken of in lectures delivered by Needham to several learned bodies in 2001, of the existence of separate patches, or islands, of ink within the printed letterforms visible on the pages of the *Bulla*, islands which were tentatively offered as evidence of the use of

elemental punches. I suspect this is because the researchers have been unable to make this evidence conform to their larger theory, and have realised that such islands may have been generated by a range of typecasting and/or printing conditions.

One specific piece of evidence proposed by Agüera y Arcas needs to be addressed. He says that Gutenberg had knowledge of casting in metal and 'certainly used casting of some sort to make the two-line slugs with which he printed the Mainz *Catholicon* [dated 1460] and several smaller works'. As I understand the current situation, 'certainly' is quite the wrong word here. The two-line slug theory for the *Catholicon* is no more than a theory, and it remains to be proven that the hand and mind responsible belonged to Gutenberg.[6] Agüera y Arcas concludes his essay on the origins of the DK type with the intriguing statement that 'Preliminary results suggest that this ... was not merely an early experiment of Gutenberg's, but may have been common to a number of early typefounders'. We can only wait, trying not to grow too crazed with waiting, for the full results of this research to be disclosed.

6. The evidence, and Needham's conclusions, appeared principally in 'Johann Gutenberg and the Catholicon Press' in *Papers of the Bibliographical Society of America* (76, 1982, pp. [395]–456), 'Corrective notes on the date of the Catholicon press' in *Gutenberg-Jahrbuch* (1990, pp. [46]–64) and 'Further corrective notes on the date of the Catholicon press' in *Gutenberg-Jahrbuch* (1991, pp. [101]–126). His conclusions and interpretations of the evidence have been questioned by other writers, notably Lotte Hellinga, who offered some 'Comments on Paul Needham's Notes' in *Gutenberg-Jahrbuch* (1990, pp. [65]–69). Albert Kapr also rejected Needham's conclusions (*op. cit.* p. 233), although that rejection is itself not entirely convincing.