



*A4 and before*  
*Towards a long history of paper sizes*

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# *A4 and before*

## *Towards a long history of paper sizes*

Before starting on this KB lecture I want to thank the two institutions that have given me such a warm and considerate welcome: the Koninklijke Bibliotheek and NIAS (Netherlands Institute for Advanced Study in the Humanities and Social Sciences). In particular, I have enjoyed the great resource of the KB's Papierhistorische Collectie (paper-history collection), which has provided most of the materials on which this lecture has been based.<sup>1</sup>

As soon as I received the invitation to take up this Fellowship, I knew that I wanted to extend a piece of research that started twenty-five years ago, when writing my book *Modern typography*, and which I had never found the time to take further.<sup>2</sup> In this book I argued that 'typography' began not in 1450 with Gutenberg, but rather around 1700 with investigations pursued by the French Royal Academy and with the people who began to advance 'useful knowledge' in the newly forming state of Britain. I wanted to shift the emphasis in typographic history away from the simply visible, and away from the view that sees history as a succession of

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<sup>1</sup> I thank especially Henk Porck, both the curator of this collection and its sole attendant, for his help and collaboration.

<sup>2</sup> *Modern typography: an essay in critical history* was written in the mid-1980s, but published only in 1992; a second edition was issued in 2004. Among the writings that encouraged my thesis was a lecture by H.D.L. Vervliet, 'Gutenberg or Diderot? Printing as a factor in world history', *Quaerendo*, vol. 8, no. 1, pp. 3–28. Vervliet suggested that Diderot, and all that he stood for, contributed as much to the development of typography as did the inventor of the printing process.

visual styles and of repeated efforts to ‘make it new’. Rather, I wanted to consider some themes that I think of as ‘deeper’: of the ordering of our activity of text and image production; of the ways in which we have been able to articulate and share knowledge, and so become more fully conscious of what we do. This starting point of the early Enlightenment marks a break with the earlier period of ‘printing’, when it was more simply a craft, and one whose workings were often kept secret. The standardization of paper sizes is a good example of this much longer sense of history, in which things change only slowly, and in which they repeat themselves.

Before getting into the discussion, I have to add a warning note: that I am fresh to the topic of paper history, and that the particular topic I have chosen to work on – sheet sizes – is, in the words of a senior colleague, “one of the most difficult themes in book-history”. I wanted to do this research partly on behalf of my fellow typographers, because I have the strong sense that we typographers and graphic designers actually know very little about paper, although we are continually choosing and specifying paper for use in whatever we are designing. So by stealing the topic from its specialist historians and giving it this attention, I hope that at least I can perform some service to my colleagues.

## **The sheet: folded and cut**

We will be looking at sheets of paper, and at folded sheets of paper. The factor of folding is one of the fundamental considerations I want to keep in mind. One might suggest that it is within the nature of a sheet to be folded. This is after all one of the ideas behind the codex-form, the common book form. Let me remind you of an agreed definition here. For bibliographers the English word ‘format’ refers not to any exact size of page or leaf or sheet, but rather to the construction of the leaves of the book.<sup>3</sup> ‘Format’ denotes how the sheet has been folded, and how many times it has been folded. Thus a ‘folio’ means that the sheet has been folded once to give four pages; a quarto means that it has been folded twice to give eight

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<sup>3</sup> A reliable guide here is Philip Gaskell, *A new introduction to bibliography* (Oxford: Clarendon Press, 1972). Gaskell is among the small handful of bibliographers who have thrown a clear light on sheet size; Allan Stevenson and Paul Needham certainly belong to this select group. I should mention also Graham Pollard’s article ‘Notes on the size of the sheet’, *The Library*, 4th series, vol. 22, nos. 2–3, 1941, pp. 105–37, which has been a constant stimulus in this research.

pages; and so on. By saying that we say nothing about the size of this folio or quarto. It's only when we know the size of the sheet that we can then say a 'foolscap folio', and – if we have agreed the dimensions of 'foolscap' – this will say exactly how large these pages actually are. This is a strong reason for knowing the size of a sheet from which the book or any other codex-form item has been made.

I want to suggest, tentatively, another fundamental consideration: as well as being folded, the destiny of a sheet is to be cut, and it may be that we make sheets of a certain size, knowing that they will be cut to a smaller size.

## Systems of paper sizes

The size A4, and the A series of paper sizes of which it is part, originated in the large effort of standardization in German industry, which was started already in the spring of 1917, when the fate of the country's war effort was uncertain, but when the need for postwar reform was already clear. So the new paper sizes are part of that industrial and commercial reorganization and modernization in Germany, and I think that the *tabula rasa* of defeat must have helped the changes needed for their introduction. This was where my interest in paper sizes started, encouraged by the time and place in which I started in typography: Britain in the early 1970s, when the country was belatedly adopting what were by then the ISO (International Organization for Standardization) paper sizes, and was going metric, as part of its entry into the European Common Market (as it was then). For a time in Britain then it was possible to feel the kind of enthusiasm for this reform that I imagine the New Typographers of the 1920s felt about the measures of the Deutsche Industrie Normenausschuß (DIN). Some typographers in Britain also wanted to abolish the old typographic measurement system of the inch-based typographic point, and replace it with metric measures – but that is another story.<sup>4</sup>

The paper series of the Deutsche Industrie Normenausschuß was very consciously formulated and was implemented rather rapidly. It can thus be considered the single exception in what is otherwise an essentially different historical pattern –

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<sup>4</sup> See now the 'Optimism of Modernity' project: <<http://www.optimism-modernity.org.uk/>>, and an article on the main protagonist of the metric point in Britain: Paul Stiff & Petra Cerne Oven 'Ernest Hoch and reasoning in typography', *Typography papers*, no. 8 (London: Hyphen Press, in preparation).

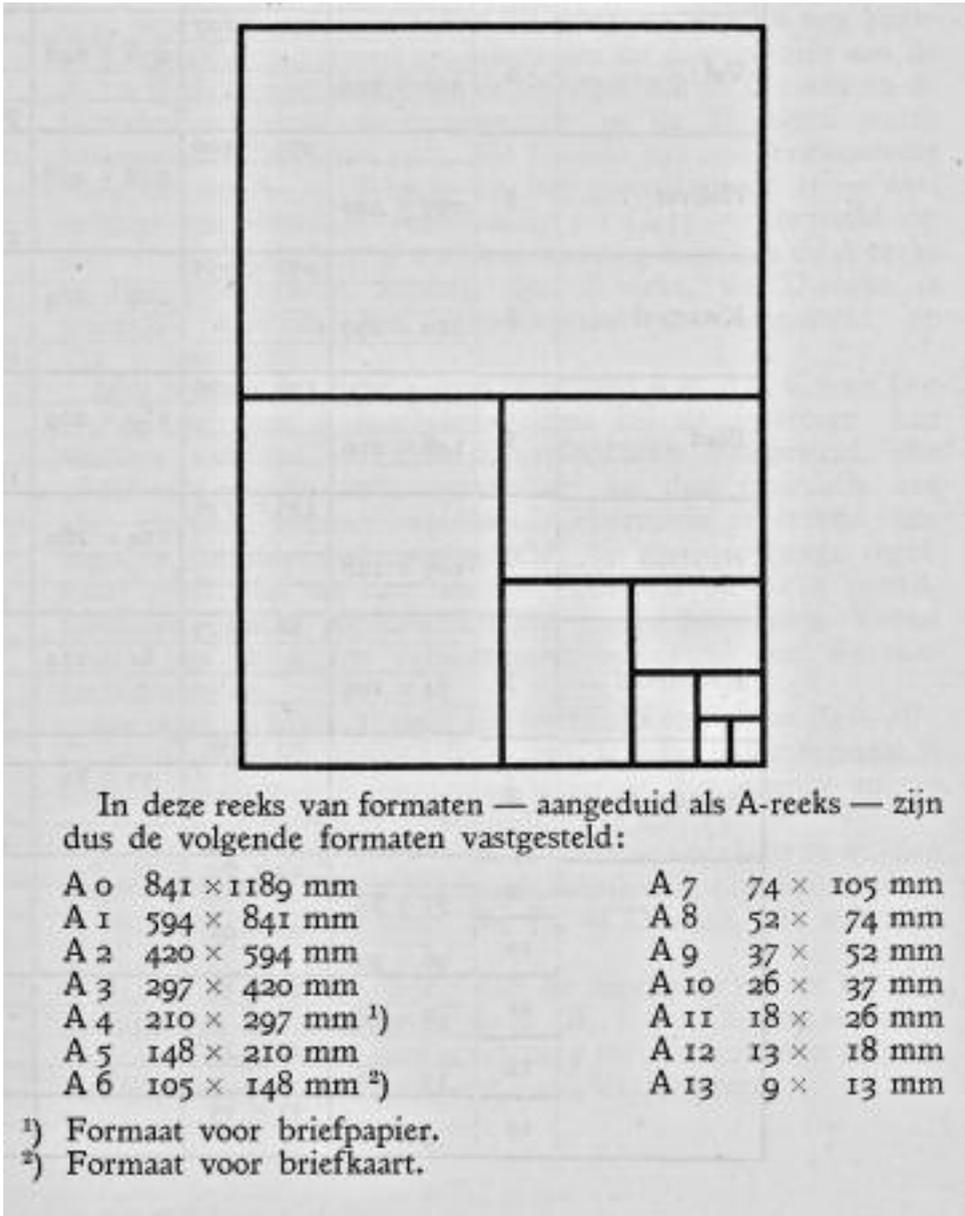


Figure 1. The principles of the DIN series were explained in a pamphlet published in 1935, by which time the system had been adopted in the Netherlands. P. Noordenbos, *Eenheidsformaten voor papier* (The Hague: Hoofdc commissie voor de Normalisatie in Nederland, 1935). (Papierhistorische Collectie, KB: PC NOORME NOO 02.)

of sizes evolving, rather than being formulated, and of sizes being taken up slowly and haphazardly, against what I suppose was some resistance or at least indifference. The DIN sizes follow a very clear system: the largest sheet, A0, has an area of one square metre; further sizes are obtained by halving. [Figure 1.] I do not have the time or space here to go further into the history of this episode of standardization, although I will pick it up again at the close of my discussion. For now I will point to the fundament of the system: that when the sheet is halved on its longest side the proportion of the sides remains unaltered. This feature brings all kinds of advantages.

The person who explained with the best sense of humour the principle of constant proportion in folding was an eighteenth-century German physicist, and a hero to those of us who have trouble with philosophy and with high art: Georg Christoph Lichtenberg. In a letter to Johann Beckmann of 1786, Lichtenberg wrote that he once gave the problem of finding the constant ratio to a young Englishman to whom he was teaching algebra.<sup>5</sup> The solution goes as follows:

We have a full sheet with sides of lengths  $a$  and  $x$ , which we fold in half on its longest side ( $x$ ) to become a folio.

So the sides of the full sheet are  $a : x$

Then the sides of the folio are  $a : \frac{1}{2}x = x : 2a$

These two sheets are to have the same proportion:

$$a : x = x : 2a$$

So:

$$x^2 = 2a^2$$

and:

$$x = a\sqrt{2}$$

So the ratio of the sides to each other will be as follows:

$$\text{the full sheet} = a : a\sqrt{2} = 1 : \sqrt{2}$$

$$\text{the folio} = \frac{1}{2}\sqrt{2} : 1 = 1 : \sqrt{2}$$

and so on ad infinitum. The constant ratio is  $1 : \sqrt{2}$ .

In this letter Lichtenberg asked a question that I can take as a starting point for my investigations: "Are the rules of this proportion prescribed to the paper-makers, or has the proportion just been disseminated through tradition? And

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<sup>5</sup> G.C. Lichtenberg, *Briefwechsel*, Band 3, Munich: Beck, 1990, pp. 274–5.

where does this proportion come from – it surely hasn't arisen by accident?" Ten years later, 1796, Lichtenberg published an article 'Über Bücherformate' in the *Göttinger Taschenkalender*, and set out a formal proof, which I have followed here.<sup>6</sup> In a memory of his lessons with the young Englishman, he wrote that 'any beginner in algebra' should be able to work out the constant ratio.

So now you see how the theme of paper size standardization fitted so perfectly with my suggestion that 'the modern' is 'an unfinished project' (to borrow again the phrase of Jürgen Habermas in his celebrated Adorno Prize lecture of 1980), and a project that came alive first in Enlightenment Europe. In fact this argument can be made even more strongly when one knows that in 1798 – or rather, on the 13<sup>th</sup> Brumaire of the Year 7 – a law setting out terms for the taxation of paper was passed in the French parliament. Six sizes of paper were proposed, five of them having the  $1 : \sqrt{2}$  proportion.<sup>7</sup>

Although this episode is well known – it was a routine element in the history that the Deutsche Industrie Normenausschuß gave in explaining its paper standardization – what is not much noticed is that the areas of these sheets sizes are given. Here is an anticipation of – or an idea shared with – the DIN system, as I will explain. The fact of imposing taxes on paper had already (France in 1741, England in 1712) entailed a definition of sizes. Of course, to define a set of sizes in law does not mean that one can take the definition as a complete and accurate description of the actually existing set of sizes in that time and place.

The law of the Year 7 was able to use the very freshly established metric system, which had been codified in a law of the Year 1 (August 1793). It is clear that such a highly rationalized system of sizes only really became possible with metrication. To describe it in a measuring system that is based in 12 units rather than 10 units, and whose allied system of measuring weights and densities is similarly duodecimal, would be – to say the least – inelegant. But, like the Republican calendar, and even more the proposal to decimalize the smaller units of time (hours, minutes, seconds), metrication of dimensions met with resistance in

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<sup>6</sup> G.C. Lichtenberg, *Vermischte Schriften*, Band 6, Göttingen: Dieterich, 1867, pp. 266–71.

<sup>7</sup> J.B. Duvergier, *Collection complète des lois, décrets, ordonnances, réglemens, avis du conseil-d'état* ..., Tome 11, Paris: Guyot, 1835, pp. 33–41. Photographs of what must be a contemporary publication of this law can be seen at <<http://www.cl.cam.ac.uk/~mgk25/loi-timbre.html>>: this is part of Markus Kuhn's very useful website 'International standard paper sizes'.

France, and even more so in the countries to which French influence was extended.<sup>8</sup> That the law of the Year 7 came to nothing seems clear: it expected paper-makers to change their norms overnight and it assumed that the metric system would be implemented quickly. But the progress of metrication was slow and was hampered by a series of set-backs and compromises. One can find some proof of this in the *Manuel du fabricant de papiers* by Le Normand, a book published in Paris in 1833. Fifty named sizes are given and they are described in the old measures of ‘pouces’ and ‘lignes’, very much as in the law of 1741. There had been a revolution, but it seems that nothing had changed in the world of paper. Only in 1840 did the metric system become legally binding in a France ruled again by kings: “The struggle between state and society was now concluded; it had lasted half a century.”<sup>9</sup>

## Early standardization

Now, I want to address this difficult and untidy matter of the sizes that were actually used before these Enlightened schemes began to be formulated and before the adoption of the DIN sizes. We can return to Lichtenberg’s question: “Are the rules of this proportion prescribed to the paper-makers, or has the proportion just been disseminated through tradition? And where does this proportion come from – it surely hasn’t arisen by accident?”

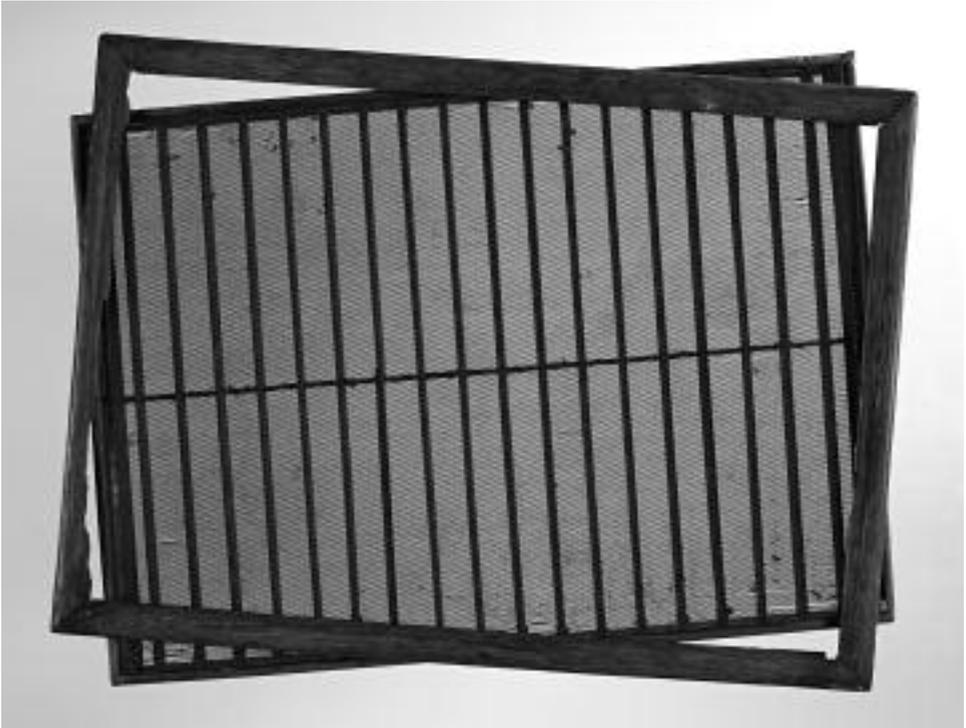
We may start with the process of making paper – if we understand this term to mean the substance that was made essentially from pulped rags – as it was carried out from its earliest stages. The place and date of the invention is commonly given as China in around 105 AD. The process of making paper began to spread west: to Baghdad (around 800), to North Africa, to Spain (around 1150), and from Spain to Italy and the rest of Europe. The process of making paper did not change much until its mechanization, from around 1800 in France and England.

The essential element in making paper by hand is the mould. [Figure 2.] The size of the mould gives the size of the sheet. So the size of the mould is already a

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<sup>8</sup> Witold Kula’s *Measures and men* (Princeton, NJ: Princeton University Press, 1986) gives a good account of this resistance, based on archival sources. I owe much to this wonderful book.

<sup>9</sup> Kula, *Measures and men*, p. 263.



*Figure 2. A mould and deckle (date unknown). The face of the mould measures 39.5 x 54.5 cm overall; the deckle measures 41 x 56 cm overall. The inside edge of the deckle measures approximately 21½ x 15½ inches: the size of sheet made by this mould. (Papierhistorische Collectie, KB.)*

standardization: once you have a mould, you cannot change its size; you can only make or acquire other moulds of a different size. This description needs to be made more precise: in the last analysis it is not the mould that defines the size, but rather the 'deckle' that gives the precise size. The 'deckle', as the German and Dutch senses of the word suggest, is a frame, or a rectangular fence, placed over the mould.

In order to keep the process going quickly, pairs of moulds were used. The maker covered a mould with the deckle, slid it into the vat of macerated fibres in water, formed the sheet of paper from the pulp he had gathered, removed the deckle and

passed the mould to his work-mate, who turned the sheet out onto a pile, interleaving each sheet of paper with a piece of felt. The whole pile was then pressed and dried. Meanwhile the maker was already at work on the next sheet, with the other mould of the pair and the same deckle that he had used for the previous sheet.

It is often said that the size of the sheet was limited by the reach of a man's arms when picking up and manipulating this rectangular framed sieve, loaded with pulp. As we will see, a large standard size in the early period of European paper-making was around 74 x 50 cm, which conforms to this idea of the limit of the human reach. But one reads, for example in *Papermaking*, the venerable and still very useful book by Dard Hunter, of Chinese, Tibetan, and Japanese moulds that were much larger than this. For example, Hunter shows a picture of a contemporary Japanese mould that can produce sheets measuring 67 by 29 inches (167 x 72 cm).<sup>10</sup> But, as he wrote, two people (he says they were women) operated such a mould, and one has to imagine a slower process here, with pauses as they discharge the incipient sheet of paper, before scooping up another with the same mould. So one might modify the 'span of the outstretched arms' theory by saying that larger sheets could be made, but that the pressure to work quickly and economically led to this constraint on size. Making paper in the Western way already had a proto-industrial quality, which must only have intensified when paper began to be made for the printing press and demand for it increased so greatly.

The founding document of standard paper sizes is the Bologna stone, which can be dated at or near to 1389, and which shows four standard sizes. [Figure 3.] One can give this date of 1389 with some certainty, because a statute from that year sets out the conditions under which paper should be made in Bologna, at that time a self-governing republic.<sup>11</sup> If paper was found being made in any other sizes it would be destroyed and the makers would be fined a sum that would range

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<sup>10</sup> Dard Hunter, *Papermaking: the history and technique of an ancient craft* (2nd edition, New York: Knopf, 1947), p. 102.

<sup>11</sup> A.F. Gasparinetti, 'Ein altes Statut von Bologna über die Herstellung und den Handel von Papier', *Papier Geschichte*, Jahrg. 6, nr. 3, 1956, pp. 45–7. Pollard, 'Notes on the size of the sheet' (p. 116), remarks that "At Bologna most of the materials for books were regulated: the number of lines to a column, the number of letters to a line, the supply of vellum (*Statuti delle Università dello Studio Bolognese*, ed. C. Malagola, pp. 30n, 144). It is not surprising, therefore, to find that the sizes of sheets of paper were also regulated there ..."



*Figure 3. The Bologna stone, showing the four standard paper sizes, circa 1389. Overall dimensions of the stone: 75 x 103 x 3.5 cm. The sizes of the rectangles that indicate paper-sheets, as given by the Museo Civico Medievale, Bologna: 50.5 x 73.5 cm; 44.5 x 61 cm; 34.5 x 50 cm; 31.5 x 44.5 cm. (Museo Civico Medievale, Bologna.)*

between 1 Bolognese soldo and 5 Bolognese lire. The statutes do not spell out the sizes of these standard sheets, rather they give weight: thus each 'ream' (about 500 sheets) of the imperial size should weigh 57 Bolognese pounds. Prices were also fixed: a ream of the imperial size would cost 7 Bolognese lire.

I feel it must be significant that there are no dimensions stated on this stone. Every commentator I have read gives the dimensions in centimetres or millimetres – an anachronism of almost exactly 400 years – though one understands that bibliographers need to use our present commonly shared measuring system (see the 'Note on measurement', p. 25). My suggestion is that for the inscription to have spelled out the sizes in the units of the time would have been taking

precision too far: it was unrealistic, given the irregularities of a sheet of hand-made paper. Instead of this, the sizes are acted out: they are there to be measured with whatever system of units you might want to employ, or simply by a direct comparison of a paper sheet to this stone (it was on display in a public place). In this respect the stone is a true 'standard': like the standard metre made of platinum, and kept in Paris, which used to be the determining measure for the metric system; or like the foot of the emperor Charlemagne – the 'pied du roi' – which it is said was the standard measure for the earlier system of measurement in France.

There is now good evidence to suggest that the Bologna sizes did become standard in Europe in the early-modern period. Charles Moïse Briquet reproduced the Bologna series in the introduction to his great book *Les filigranes* (1907), and discussed the evidence for the continuation of these sizes into later times and into other countries.<sup>12</sup> Paul Needham, writing in 1988 and after considerable study of early books, confirmed that:

"In the first several centuries of European paper-making, there seem with few exceptions to have been only four sizes, whose approximate dimensions may be given as follows:

Chancery: ca. 32 x 45 cm

Median: ca. 35 x 52 cm

Royal: ca. 43 x 62 cm

Imperial: ca. 49 x 74 cm."<sup>13</sup>

And these, more or less, are the Bologna sizes, as given by Briquet. One can notice that what Needham (following a conventional usage) terms the chancery size, and which on the Bologna stone is called 'reçute' has proportions near to the DIN series: 1 :  $\sqrt{2}$ . So here is an answer to Lichtenberg's question: a size of constantly maintained proportion was explicitly prescribed already in the fourteenth century and was widely used.

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<sup>12</sup> M. Briquet, *Les filigranes*, Paris: Picard, 1907,

<sup>13</sup> Paul Needham, 'The study of paper from an archival point of view', *IPH Yearbook*, vol. 7, 1988, pp. 122–35, at p. 126. In the context of the present discussion, the whole of Needham's thought here is apposite: "I should mention what is perhaps the most neglected single aspect of paper study, at least in the fifteenth century: paper sizes. I must confess that the importance of recording, and thinking in terms of, paper sizes has come upon me only slowly over the years, but I see now that it is really fundamental. It is also, like so much in paper study, very simple."

One intriguing piece of research here is a survey, published in 1980, of 2,395 manuscript books, written on parchment and on paper. J.P. Gumbert and his assistants found that the  $1 : \sqrt{2}$  proportion predominated, in both parchment and paper books, through the period they were looking at: from the eighth to the fifteenth centuries.<sup>14</sup> Another of their findings was that the paper manuscript-books tended at their beginning, in the fourteenth century, to cluster into 'distinct format groups': the predominant group having dimensions of about 30 x 21 cm (the size of A4), and the secondary group being around 21 x 15 (the size of A5). Later this clustering is 'less distinct through the increasing use of intermediate sizes'.

Gumbert's survey would seem to throw some light on the notion that paper sizes followed on from parchment sizes – a suggestion that is sometimes made. It's clear that animal skins are larger than the largest sizes at which paper was made by hand. The size of a sheepskin has been given as 4 x 3 feet (1.22 x 0.92 metre), that of a calfskin as 6 x 4 feet (1.84 x 1.22 metre).<sup>15</sup> So this is considerably larger than the largest size of sheet in early European paper-making (0.74 x 0.5 metre), and there would seem to be no link of size or proportion between skins and sheets of paper. The uses of a book, rather than the material of the substrate, would seem the primary factor in determining page-size: bibles and psalters of different kinds maintained their page sizes, whatever the substrate used – parchment or paper.

We can, however, develop Gumbert's observation that paper manuscript books formed two distinct format groups. A chancery sheet (45 x 32 cm) would be the obvious starting point, in folio format, for books that approximate to our A4, and could generate an 'A5' quarto page when folded a second time. Gumbert's observation that these two groups tended, later on, to dissolve into a continuum need not contradict the picture of an early and quite severe standardization of sheet size. In the middle of the fifteenth century printing was introduced and it began relatively rapidly to increase the demand for paper. With increase in numbers produced would come the pressure to limit and standardize the size of the sheet. Meanwhile, any manuscript book made in the incunabula period

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<sup>14</sup> J.P. Gumbert, 'The size of manuscripts', in: A.R.A. Croiset van Uchelen (ed.), *Hellinga Festschrift*, Amsterdam: Israel, 1980, pp. 277–87. I discovered a subsequent paper by Gumbert too late for proper consideration here; some of the points I make here need modification in the light of it: J.P. Gumbert, 'Sizes and formats', in: Marilena Maniaci and Paola F. Munafò (ed.), *Ancient and medieval book materials and techniques*, Vatican City: Biblioteca Apostolica Vaticana, 1993, vol. 1, pp. 227–63.

<sup>15</sup> Pollard, 'Notes on the size of the sheet', at pp. 110–11.

required a much smaller stock of paper, and in this respect would be less subject to the tendency to standardize.

## The consequences of printing

Printing is inherently a process of mass-production and in this way encourages norms and standards in its materials. Certainly printing has been a strong factor in stabilizing and standardizing the graphic form of a language – its orthography – and in stabilizing whole texts. As Lewis Mumford wrote, ‘the printed sheet, even before the military uniform, was the first completely standardized product, manufactured in series’.<sup>16</sup> So too the physical materials of printing – type and spacing elements, and nowadays font formats and ink colours – have been standardized to allow easy exchange and combination. And so too we can look to the constraints of a printing press as a factor in the determination of paper sheet-size. Paper-making is constrained by the size of the mould, and the capacities of a printing press are similarly limited by clear physical borders. Hand-presses of the early period and up to about 1800 were, in the last analysis, limited by the size of the frame in which the type was held – called a ‘chase’ in English. To quote Philip Gaskell’s summary: ‘in normal working the type area was limited to about 49 x 39 cm (19 x 15½ inches), but with a large press and a large chase it could be pushed up to about 62 x 47 cm (24½ x 18½ inches).’<sup>17</sup> Yet the size of sheet that could be used in a hand-press (and held in its ‘tympan’) was larger: Gaskell estimates that the press described by Joseph Moxon towards the end of the seventeenth century could accommodate a royal sheet of 23½ x 18½ inches (about 60 x 46 cm), and he reports that surviving eighteenth-century presses could take super royal sheets of 27½ x 19¼ inches (about 70 x 50 cm).<sup>18</sup> The manuals of printing that began to be published from the late-seventeenth century onwards gave schemes of imposition, and these diagrams explain the relation of page size to the size of the sheet, and the size that a press could print.

So we can say that up to about 1800, the printing press provided a clear limit on the size of the sheet – no larger than the size that could be carried in its tympan.

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<sup>16</sup> Lewis Mumford, *Technics and civilization*, London: Routledge, 1934, p. 135. By now this is a familiar idea: for example Vervliet touched on it in his ‘Gutenberg or Diderot?’ (note 2, above).

<sup>17</sup> Gaskell, *A new introduction to bibliography*, p. 121.

<sup>18</sup> Gaskell, *A new introduction to bibliography*, p. 123.

But it is also true that at some point in the preceding period, standard sizes – or at least named sizes – began to increase in number. One can follow this through a number of means: surviving descriptions by printer-publishers of their paper requirements; regulations issued by authorities, especially for taxation and customs duties; and by empirical observation. After years of close examination, Allan Stevenson could report that in the seventeenth century in England: “in place of the two sizes, small and large, of Caxton’s time, there have developed ten or a dozen sizes. Five or six of these are Anglo-Norman, three or four from the Angoumois in southwest France, others from Genoa and Venice, and perhaps even remote Auvergne. For, as most people now know, practically all the paper used in England before the Glorious Revolution [1688] was imported. In the first half of the century around 95 per cent came from Norman mills.”<sup>19</sup> Stevenson goes on to list five sizes of Norman paper in two qualities, ‘ordinary’ and ‘fine’, from smaller to larger: pot, foolscap, crown, demy, lumbard. Each of these, he says, would carry a typical watermark; thus foolscap paper of ordinary quality was denoted by a ‘fool’ watermark.

A primary piece of evidence here is the inventory of papers offered in 1674 to Dr John Fell, then in effective charge of Oxford University Press.<sup>20</sup> One sees here that what one might call the system of English paper sizes was by then essentially established. The list, going from large to small, consists of variations on the sizes that would become known as super royal, royal, medium, demy, crown, foolscap, pot. Looking back to the Bologna sizes, one can equate super royal with the Bolognese imperiale, royal with reale, demy with meçane, foolscap with reçute. So, by this date in England three new sizes had been added: medium, crown, pot.

Looking at the various tables of sizes that were published during the eighteenth century, one sees a proliferation of sizes and names. Thus in Charles Leadbetter’s *The royal gauger*, a compendium of information published first in 1739, giving advice and instructions for English excise officers, a table of names and dimensions was published.<sup>21</sup> Three categories or qualities are indicated: brown papers

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<sup>19</sup> Allan Stevenson, *Observations on paper as evidence*, Lawrence, KS: University of Kansas Libraries, 1961, pp. 9–10.

<sup>20</sup> R.W. Chapman, ‘An inventory of paper’, *The Library*, 4th series, vol. 7, no. 4, 1927, pp. 402–8.

<sup>21</sup> This table is reproduced, in two slightly different editions, by Rupert C. Jarvis in his ‘The paper-makers and the excise in the eighteenth century’, *The Library*, 5th series, vol. 14, 1959, pp. 100–16 (at p. 107), and by H. Dagnall, *The taxation of paper in Great Britain 1643–1861*, Edgware:

(wrapping papers); whited browns, which one can guess would have been a paper of intermediate quality; then the first-quality papers, among which 'printing' and 'writing' sizes are indicated. To the seven sizes that we can see in the inventory of 1674, we now find a few more: 'large post' (but this is effectively 'crown'), 'fan' in large and small varieties, 'chancery double', 'bastard or double copy'.

The differentiation of printing and writing sizes of the same named category of sheet size is worth noting, and is some evidence in support of my suggestion that paper has been made with the knowledge that it would be cut. So, for example, in Leadbetter's table we find 'printing demy' and 'writing demy', with the 'printing' sheet being three-quarters of an inch longer and a half inch wider than the 'writing' sheet; 'printing foolscap' and 'writing foolscap' are one-and-a-half and a half inch different in length and breadth.

The table published in France in 1741, which has become well known through its subsequent republication in several important sources, gives fifty-six named papers, though some of these indicate variations of weight and thickness ('très-mince') of a certain size.<sup>22</sup> Even allowing for some duplication here, with the same size being listed twice under different names, it is clear that the number of sizes was proliferating, with intermediate sizes and slight variations being generated. Why should this have happened? One can only speculate that this was a consequence of the growth in commerce, both in the paper trade and more generally, and a consequence of the growth in paper-making. Certainly in England, the growth in paper-making was notable: from importing most of its paper in the seventeenth century, to making most of the paper it needed in the eighteenth century. This development was encouraged by the imposition of heavy duties on imported paper. When, in 1712, taxes on domestically made paper were imposed in Britain, different principles of taxation being tried in succession: by value, by physical description, and by weight. For a time, in the eighteenth century, papers that met the statutory specifications of name and description (size) were taxed at specific rates, and any paper not conforming to a description was charged by value. This might seem to have encouraged paper-makers to stick to the specified

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Dagnall, 1998 (at p. 17). Jarvis and Dagnall provide useful accounts of the very complex topic of paper taxation in Britain, and I have drawn on them for what I say here.

<sup>22</sup> The table was given in Joseph Jérôme Lefrançois de Lalande's *Art de faire le papier* (1761), in the article on paper in the *Encyclopédie méthodique* ('Arts et métiers mécaniques', vol. 5, Paris, 1788), in C.M. Briquet's *Les filigranes* (1907).

sizes. In the long run, one can postulate a process of unspoken regulation, in which makers made sizes according to the demands of their customers and according to their own patterns of limitation. It would make sense for any maker to limit the number of sizes that they offered.

## Newspapers

For some illumination of the most pressing factors that affected the size of the sheet, we can turn to newspapers. The names by which we refer to the category of the newspaper are suggestive. These names often have an element of time: 'journal', 'giornale', 'Zeitung', and in English we speak about 'the dailies', 'the sundays', 'the weeklies'. In Dutch the short word for newspaper is 'krant', which derives from the Latin words 'courante', 'coranto'. The idea is of running, of speed. This dimension of time is a defining fact of newspapers. The pressure is always to produce an edition with the latest news, and thus the pages must be printed in the shortest time and probably overnight.

In English, referring to the size of the printed sheet, we also speak about 'the broadsheet press', 'the tabloid press', and in general we often speak about 'the papers': 'did you read today's paper?' With a newspaper we are presented with a set of loose sheets of paper, each of them folded once; in some cases there will be a single unfold sheet interleaved; or in the simplest case, the paper will consist of just one unfolded sheet. This sheet is the space of the newspaper.

The earliest publications that we can recognize as newspapers – being more than just occasional announcements, and possessing a clear periodicity – were printed in Amsterdam.<sup>23</sup> From at least 1618 the *Courante uyt Italien, Duytslandt, &c* was printed and published there. The same publisher (Caspar van Hilten) also published a paper in French from Amsterdam. Soon after this an English-language title was issued from Amsterdam. Early titles appeared also in Arnhem and perhaps Delft. These first newspapers took the simplest form: one sheet of paper, without a fold, and printed in two columns on both sides.

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23 The pioneering historian of the early Dutch newspapers was Folke Dahl. See his publications: 'Amsterdam: earliest newspaper centre of western Europe', *Het Boek*, vol. 25, nr 3, pp. 161–97; *Dutch corantos 1618–1650: a bibliography*, Göteborg: Stadsbibliotek, 1946; 'Amsterdam: cradle of English newspapers', *The Library*, 5th series, vol. 4, no. 3, 1949, pp. 166–78.

Why were the Dutch the first newspaper publishers? One can put forward two simple reasons: the climate at this time of relative political freedom, and a strong culture of printing and publishing. English newspapers were slower in coming. *The Oxford Gazette* (from 1665) has the newspaper format that we recognize in the Dutch corantos: a single sheet (in fact a half sheet), printed both sides. This paper was published only with Royal permission – the court had moved to Oxford at the time of the Great Plague in London – and was not for sale to the general public. After the plague had died down, the court moved back to London and it became the *London Gazette*, eventually becoming the official conduit of state news. It was only after the relative liberalization that followed on from the events of 1688, when William of Orange came to take up the role of joint sovereign, that newspapers began to become possible in England. The Bill of Rights was passed in 1689, and in 1694 the English parliament refused to renew the Licensing Order of 1643, which had acted as a charter for censorship of a broad range of publications. The way was now open for the flourish of publishing that distinguished the British eighteenth century.<sup>24</sup>

As this nutshell account may suggest, when discussing newspapers, it is necessary to discuss politics. But as well as the broader context of freedom to publish, one also sees a specific political-economic factor that bears on newspapers through the eighteenth and nineteenth centuries, and which directly touches our topic of sheet size. This is the taxes that were levied on British and Dutch newspapers, sometimes for pure economic reasons (usually, to pay for a war) and sometimes with some intention of curbing publications that might give trouble to the governing party. As with the taxation of paper as such, the duties imposed on newspapers had to find a criterion of taxation, and often it was the size of the sheet. Thus in 1674 in Holland a tax of ‘4 penningen’ per sheet was raised on newspapers printed within the country, and ‘8 penningen’ per sheet on newspapers printed abroad.<sup>25</sup> In Britain stamp duty on paper was introduced in 1712. This act of parliament taxed paper at its source: the paper-makers. Sheets intended for use as newspapers had to carry a newspaper duty stamp. This duty would then have been added by the maker to the price of the paper.

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24 ‘Great Britain’ (which consists primarily of England, Scotland and Wales) came into existence formally in 1707, with the Act of Union of the Scottish and English parliaments.

25 Maarten Schneider (with Joan Hemels), *De Nederlandse krant 1618–1978*, 4th edn., Baarn: Het Wereldvenster, 1979, p. 171. I have relied on this book for what I write here about Dutch newspapers.

In the British act of 1712 papers were taxed by sheet name and size: fine papers of a given size incurred a higher payment than 'second' quality papers of that size. According to one historian of British newspapers, this encouraged the use of additional half sheets, which could escape the strict application of the law. While a single half sheet (two pages) and a folded sheet (four pages) were described in the act, "papers made up of a whole *and* a half [six pages] went free because the law had not foreseen the development of papers of more than one whole sheet".<sup>26</sup> Later, in 1725, the law was amended to ensure that any paper used as newsprint should carry a tax stamp.

The same principle of taxation by size of sheet was applied in the Netherlands. In 1812, in the time of French rule of the country, a system of taxing by area was introduced. This decree certainly has the flavour of the revolutionary-rationalism from which it had come (France in 1797): a tax of 3, 4, 5, or 8 centimes was liable, depending on the surface area of the sheets used. For example, newspaper publishers paid 5 centimes for 2500 square centimetres of paper.<sup>27</sup> This tax was then carried over into the years of independent rule, with centimes converted into penningen, and centimetres into palmen (1 palm was 10 centimetres, in the domesticated metric system of that time).

The effects of taxation on newspaper size became visible for a short moment in 1844–5. In 1832 a law had decreed that any publication of reports and announcements with an area of less than 2 square 'palmen' could go tax free. In 1843, and coming into effect 1 April 1844, this law was extended to include 'all printed matter'. Four small-format newspapers, called 'lilliputters' were already publishing in 1844, and their number then grew. Ten new titles appeared in that year, taking a critical stance against the government. But in October 1845 the matter was debated in the parliament; both houses voted to impose taxes on all printed matter.

Stamp duty on newspapers was continued in the Netherlands for another twenty-five years, being lifted finally with effect from 1 July 1869, after a long campaign against it. On that day the *Leidsch Dagblad* appeared in an enlarged format, with

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<sup>26</sup> Stanley Morison, *The English newspaper*, Cambridge: Cambridge University Press, 1932, p. 86.

<sup>27</sup> Schneider, *De Nederlandse krant 1618–1978*, p. 173.

these rousing words from its publisher:

“De groote dag is aangebroken, de dag waarop de dagbladen gelijke rechten hebben gekregen met de meer volumineuse voortbrengselen van de menschelijken geest, dat zij onbelemmerd, zonder belasting, mogen verschijnen! Wat voor een jaar een droombeeld scheen, en in een verre toekomst verscholen ideaal, is thans werkelijkheid geworden. De zegelbelasting op de dagbladen is in ons land afgeschaft.” [“The great day has dawned, the day on which the daily newspapers have acquired the same rights as the human spirit’s more extensive productions, so that they can be published without obstruction, without taxation! What seemed a year ago to be just a dream, an ideal hidden far in the future, is now become reality. The stamp tax on newspapers has been abolished in our country.”]<sup>28</sup>

In England the newspaper duty had been abolished in 1855, with duties on all paper being withdrawn in 1861. Taxation clearly played a role in the size of newspaper pages, but one can point to large-format Dutch and English newspapers that had begun to appear already before 1869 and 1855. Evidently, for some publishers, the pressure to increase the size of the page – to carry more news and advertisements for the same effort of printing – outweighed the tax burden. The page size of newspapers gives us some vivid signs of changing pressures in publishing in this period. But for more fundamental factors in the changes, one needs to turn to the realm of technics.

In the nineteenth century, especially in England and then America, newspapers were at the front of developments in the improvement of printing. With the iron press of Earl Stanhope (developed in 1800–3, and becoming generally available in the mid-1820s), the printing area could be increased. By the 1820s iron hand-presses could print sheets of up to double royal size (40 x 25 inches [102 x 63 cm]), with a type area of 98 x 58 cm.<sup>29</sup> The greatest development in press technics came with the development of mechanically powered presses – at first this was steam-power. Friedrich Koenig’s press, introduced in 1814 at *The Times* in London, was the first of these. The way was now clear for a more significant enlargement of sheet size in printing.

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<sup>28</sup> *Leidsch Dagblad*, nr 2879, 1 July 1869, p. 1.

<sup>29</sup> Gaskell, *A new introduction to bibliography*, p. 199.

## Mechanization of paper-making

The mechanization of paper-making was perhaps a necessary precondition of the greater demand for paper that powered-printing would entail; just as hand-made paper (in place of parchment) had been necessary to the full realization of the hand-press. As with the powered press of Koenig, powered paper-making machines were developed and put into commercial use first in England, the epicentre of advancing industrialism, having been invented by a ‘foreigner’, in this case the French Nicholas-Louis Robert.<sup>30</sup> The first mechanized paper-making machines were driven by water power; they show the principles of the existing hand-process adapted to continuous working, with rollers replacing the containing frame of the mould. The product, at the end of the line, is a roll of paper. [Figure 4.] The length of the roll is so great as to be unimportant; the width is the interesting and critical dimension.

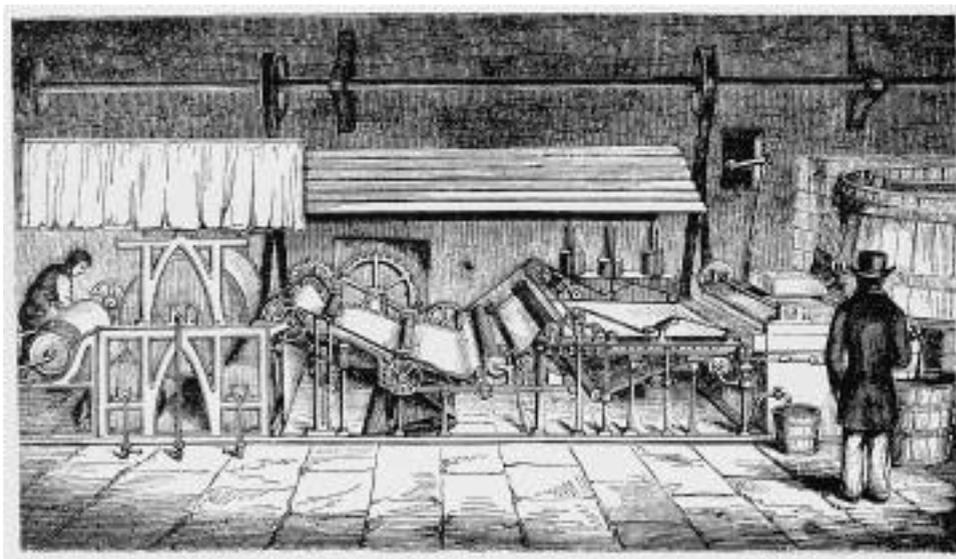
Already with the first paper-making machine, the size of the sheet was markedly expanded: the width of the wire-cloth that carried the paper in formation was 54 inches. A machine of 1804 is reported as making a web of 152 cm wide (60 inches). Were there limits on the width of the roll? A British paper-maker, writing in 1873, is quoted as saying: “A positive limit is set to the width of the machine of the present construction by the proportions and capabilities of the human body. The machine-tender must be able to reach the middle of the sheet with one hand, so that every part of it may be taken hold of by the men on both sides.”<sup>31</sup>

For our investigation of sheet size, the most important feature of the paper-making machine, which can be seen already in early versions, is that the width of the roll could be varied. This was done by an adjustment of the ‘deckle straps’: two leather strips in loop form, placed at the edge of the sheet as it changed from pulp into paper, and which set the width of the roll. This ensemble performed exactly the function of the deckle of the hand-mould.

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30 The standard work on this subject is R.H. Clapperton, *The paper-making machine*, Oxford: Pergamon Press, 1967.

31 Clapperton, *The paper-making machine*, p. 247. While this relation to the human reach might still play a part for paper made on a smaller scale – for example, for book production – it is clearly not the case for newsprint, now made in rolls of much greater width; Gaskell (*A new introduction to bibliography*, p. 221) mentions a width of 10 metres.



*Figure 4. A paper-making machine shown in 1859, though the machine was probably constructed earlier. The process moves from the vat on the right to the finished roll on the left; the deckle straps ride above the forming paper, on pulleys; above are two covers: a solid one to protect the wire, and a hood above the drying paper. (R.H. Clapperton, *The paper-making machine*, Oxford: Pergamon Press, 1967, p. 195.) (Papierhistorische Collectie, KB: PC FABMA CLA01.)*

## **Prescription and tradition**

One might say that with the mechanization of the paper-making process, there was the possibility of infinite flexibility in the size of the sheet. Yet the norms would still play their part: once established, there is always the tendency to continue with them. Manufacturers and publishers will always want to carry on with their usual sizes and formats, for reasons of economy as well as of inertia. But now – in 1918 in Germany – there was as good a chance as there ever could be to introduce a new set of standards.

The fundamental principle of the DIN paper sizes is their constant proportion of  $1 : \sqrt{2}$ . The second fundament is that the basic sheet of A0 from which other sizes

are derived has an area of 1 square metre: so its dimensions are 1189 x 841 mm. This then gives us the A4 size (with a bit of rounding up and down, along the way) of 297 x 210 mm.<sup>32</sup> Sheets of paper will be made in sizes smaller than A0, and then cut into yet smaller sizes than A4, but it is this theoretical construct of the A0 sheet that is useful. A critical measure of paper is its weight: that is the main factor that we use in specifying a paper in printing. Let's say we have a sheet that weighs 80 grammes per square metre. The A0 sheet will weigh exactly 80 grammes, the A1 sheet will weigh half that – and so on. One then knows, almost without the use of a pocket calculator, that 500 sheets of 80 g/m<sup>2</sup> A4 paper will weigh 2.5 kilos. The world of paper thus benefits from this great simplification.

The main DIN series of A sizes was supplemented by further series: a B series gave a set of intermediate sizes, still with the same constant proportion; the C series was useful for containers, especially envelopes. Another set of intermediate sizes of constant proportion, the D series, was worked out, but never put into practice. Further, the need to make sheets that allowed for cutting led to the provision of 'raw format' (RA) and 'secondary raw format' (SRA) series of sizes. Thus the RA0 sheet is 1220 x 860 mm (approximately 1.05 square metres area), the SRA0 sheet is 1280 x 900 mm (approximately 1.15 square metres area). These 'raw' series continued, and made more precise, the old habit of making 'writing' and 'printing' sizes.

Looking around any office of the western and westernized world – with the great exception of North America – one sees that the DIN and now ISO sizes have been victorious. The printers churn out A4 sheets, they are punched with two holes set according to ISO regulations, filed into binders whose size depends on A4, or are folded and inserted into C series envelopes, and stamped with stamps of A10 or A11 size. The only threat to this system is the disappearance of paper itself.

Yet, look now at your bookshelves, or at any pile of magazines and newspapers, and one sees a different scene. There are some ISO-determined sizes there – for example, the main sections of the *NRC Handelsblad* and the *Volkskrant* approximate to A2 – but mostly there is a variety of sizes that cannot be related

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<sup>32</sup> Here lies the main difference of the DIN series with that proposed by an immediate precursor in Germany, the chemist Wilhelm Ostwald. In 1911 Ostwald had published an outline of his 'Weltformate', which started with the smallest size (I) of 1.41 x 1 cm. His size X – 32 x 22.6 cm – would be the sheet used for letters. Ostwald's largest size, XIII (128 x 90.5 cm), is used in Switzerland, even now, as a standard size for posters.

to any of the DIN and ISO series. These are page sizes that have been evolved, and which it has become convenient and economic for publishers to employ. A standardization can be seen here, but it is not one that has been ratified by the ISO Secretariat in Geneva.

In this respect, history has continued to change slowly. Or, more precisely, the technical means have changed radically, and we now find ourselves in a place that is both different from the past and yet very reminiscent of how it was 300 years ago. Some of the page sizes used in the Anglo-American sphere – which, in the case of the large publishing conglomerates, now covers the world – will still carry with them their origins in the old duodecimal measures, even if they are now described in millimetres. Large users of paper have the ability to set their own standard sizes of sheet and of format. For them, as for the rest of us, the imperative – becoming ever more urgent – is to use paper wisely and without waste.

### **A note on measurement**

Even North-American bibliographers habitually use the common language of scientific description, measuring their objects of study in centimetres and millimetres. These are certainly the most workable units to use, and it would be hard now to make an exact description of the size of a page, or of lines of text, using inches and fractions of inches.

Yet there is always a case for using the units that the makers of an object used, as a way of understanding the design of that object: 'design' in the deepest sense of conception and planning. Imagine it the other way around, by thinking how one might describe an A4 sheet in inches. The only meaningful way to describe A4 is in millimetres: 297 x 210. '297' might seem an arbitrary number, but it has meaning within the system of the A series of paper sizes. Now, how should one describe a sheet of North American 'letter' paper? One might take out a ruler and say 279 x 216 mm. These numbers may describe the sheet we are presented with quite well, but not as meaningfully as the description of 11 x 8½ inches. Those are the dimensions of the conception of the sheet.

This principle of appropriate measurement can be applied to anything made in pre-metric and non-metric times and places. A sheet of paper made in England or France or Germany in 1750 cannot have been conceived in metric terms, and it makes sense to think of it in terms of inches or pouces or Zoll. It can be enlightening to take up an inch measure and see

that a sheet is about, say, 20 inches in length – the length that its makers clearly intended, even if they achieved only an approximation of that.

One has then to add some complicating and enriching factors. Hand-made paper, almost by definition, has rough edges. How does one measure such a sheet? It will always be an approximation and it must be better to be honest about that and not try for exaggerated accuracy. ‘About 50 cm’ is in this case a more truthful description than ‘502 mm’. If one can add ‘about 20 inches’ that would seem helpful and a gain in information. One can then imagine that the makers of 1750 had 20 inches in their minds; they could not have been thinking ‘50 cm’. When Philip Gaskell wrote that chain-lines in laid paper run at “intervals of about 25 mm parallel to the shorter edges of the sheet”, he skates over a more interesting and richer thought: that the chains seem on average to be an inch apart.<sup>33</sup> One can well imagine a mould-maker trying for an inch distance in spacing the chains, if not quite succeeding: an approximate inch did the job perfectly well.

There is another complication: what is an ‘inch’, a ‘pouce’ or a ‘Zoll’ anyway? There is abundant evidence to tell us that these units had different values in different places at any one time, and that they changed over time. For example, a regulation of paper published in Prague in 1759 gives two tables for paper sizes: one that uses Vienna units and the other uses Prague units. ‘Kleine Noten-Papier’ was 16 x 12½ Zoll in the former, and 17 x 13¼ Zoll in the latter: it was the units that differed, not the lengths measured.<sup>34</sup>

The shifting values of old measures make it hard, and sometimes impossible, to measure with them with any certainty. Nevertheless, I suggest it is worth trying to think in terms of historical units, and to resist the tendency to use only centimetres and millimetres. And further: historical, duodecimal units pretend less than the metric system does to very fine accuracy, and are thus more appropriate in measuring items that are by their nature slightly rough and variable, both in shape and in dimensions.

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<sup>33</sup> Gaskell, *A new introduction to bibliography*, p. 60.

<sup>34</sup> István Bogdán, ‘Miscellen zur Papierzeugung vor 200 Jahren’, *Papier Geschichte*, Jahrg. 14, Nr 1/2, 1964, pp. 8–16 (at p. 16).

## About the Author

Robin Kinross is a typographer, publisher, critic, and author of numerous articles in the field of visual communication and typography, published mainly in the UK, the Netherlands and the USA. After secondary school, he studied English literature at (what was then) the North-West London Polytechnic in London, and then, from 1971, he studied Typography & Graphic Communication at the University of Reading. He founded the publishing imprint Hyphen Press in 1980. He has contributed regularly to magazines such as *Information Design Journal*, *Blueprint*, *Journal of Design History*, and *Eye*. He is the author of *Modern typography* and *Unjustified texts*.

Robin Kinross follows Lisa Jardine, Jonathan Israel, Robert Darnton, Emmanuel Le Roy Ladurie and Peter Burke as the sixth international scholar of renown who has been attached to the KB and NIAS as a Fellow since 2005.

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