PLANNED SPONTANEITY:

The Construction of a Modular System of Relief Printmaking Matrices for the Platen Press

Edwina Ellis

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This thesis could not have been written
without the extraordinary generosity of
Graham Williams
Penny David
and
Philip Ellis

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed E. Ellis (candidate)

Date May 2010

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended

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The Modular System draws on traditional wood engraving, woodcut and letterpress practices. It comprises two printing surfaces and printing furniture specifically devised to facilitate offset and transfer relief printing.

Rigid acetal resin tint blocks, hand or laser engraved, generate tone or colour that may be applied to more than one image. Multiple overprinting produces variant colour mixtures. Their function is similar to late nineteenth-century tints devised for colour letterpress printing. Compound printing surfaces of linoleum or vinyl are segmented and joined to make removable and replaceable parts. They print variable configurations in a process that resembles historical solutions to simultaneous colour printing: from the Mentz Psalter (1475), to the compound plates of William Congreve (1820) and the segmented wood engravings of John Holt Ibbetson (1819). These compound surfaces also act as receptors for impressions from the tint blocks. Repositioning and offsetting them is expedited by press furniture especially devised for the project. Registration devices are based on the simple Japanese *kentō* system and laser-cut circular chases derived from traditional letterpress furniture. Printing the tint blocks directly onto the flexible compound surfaces produce two viable prints that are offsets of each other. They are reversed, but one offset is also tonally inversed. It is this unpredictable tonality that has driven this experimental project.

Both the construction and processes developed using the Modular System directed historical research into functional colour relief printing which consequently unearthed examples that would influence the further development of the project. This has generated both devices and processes capable of wider applications. Printing surfaces employed in the Modular System may be laser engraved or cut and adapted to use in both lithography and intaglio printmaking.

The approach to the starting point of the project was traditional wood engraving: a process that is largely perceived to be the action of incision into an end-grain wood block. With notable exceptions, it involves a degree of planning which tends to be the main influence on the graphic animation of the block.[1] Manuals still usually feature an ultimate chapter on 'printing', and both Walter Chamberlain's *Manual of Wood Engraving* 1978 and his *Manual of Woodcut Printmaking* 1978 end with a valuable but identical chapter on relief printing.[2] It is evidence of an affinity, forged by the relief printing process, of printing surfaces which otherwise require different treatment: woodcut is *cut* on the long grain, and with hollow tools. That a putative printer of wood engravings could learn from the chapter demonstrates Chamberlain's ability to explain technical processes – but also that the procedure is simple enough to do so in a book chapter.

The basics of relief printing are as old as printing practice, and share ancestry with the genesis of printing in China.[3] Relief printing with a press in fifteenth-century Europe developed in tandem with type.[4] The *relief* printing process denotes the use of hand-printing, by burnishing or stamping, or a relief press. The use of such a press is often termed *letterpress*, which shows the close association of relief printing with movable type, and how, with the small scale of wood engraving, literally aligning with type could remain a strong influence on wood-engraved graphics.[5] As the practice of infrequent proofing before ultimate printing is connected to the nature of woods still in use for engraving, it would be only slightly generalising to state that printing remains a latter

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[1] Naum Gabo (1890-1977) Williams, G. (1987). Naum Gabo Monoprints : from Engraved Wood Blocks and Stencils. Ashford, Florin Press for Kettle's Yard, Cambridge & The Talbot Rice Gallery, Edinburgh.
[2] Chamberlain, W. (1978). The Thames and Hudson Manual of Wood Engraving. London, Thames and Hudson, Chamberlain, W. (1978). The Thames and Hudson Manual of Woodcut Printmaking. London, Thames & Hudson. Chamberlain writes about listening to ink hiss and the silken texture of correctly rolled ink – Like myself, Colin Paynton (*verbatum, 1998 Oxford*) cites the chapter as a valuable guide.
[3] The long evolution of Seals, to specifically reverse cut hand-held relief stamps began before 500 BC when their use for validation included utilisation of red ink 'around 500 BC'. Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. p. 13
[4] Landau, D. and P. Parshall (1994). The Renaissance Print: 1470-1550. New Haven; London, Yale University Press. p. 2
[5] '…the stronghold of the art' is the conjunction of the press and type with engraving. Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p. 650

action in the wood-engraving process – and that the ink is usually black. [6]

In order to explain the background to a project featuring relief engraving, beginning with the methodology of Thomas Bewick (1753–1828) has proved unavoidable. Although his work has had no conscious influence on the project, the previous practice evolved from traditional British wood-engraving processes, which were pioneered by Bewick. His work and practice not only introduce the accepted perception of a wood-engraved print and the more hidden applications of the medium, but also identify quandaries which the practical project attempted to address. Bewick understood more applications of his craft than he had time to pursue, and his own words additionally describe the manner in which the previous work departed from what is seen as the traditional model. Moreover, Bewick's predictions for the potential of the medium delineate strategy which is exploited in the project.

Bewick was aware of colour, and regretted its usual absence in wood engraved prints.[7] The transfer drawing, print and watercolour study of *The Great Spotted Woodpecker* (1797) (**Fig 1:1** p.4) show how Bewick illustrated his pioneering natural history works 'by figures delineated with all the fidelity and animation' he 'was able to impart to mere woodcuts without colour.'[8]Although the black print exemplifies what is understood by the term 'wood engraving' (**Fig 1:1b**), Bewick consciously 'attempted *colour* upon the

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[6] Boxwood *Buxus sempervirens* is still primarily used for engraving, but lemon woods *Calycophyllum candidissima & multiflorum* are also widely used. End-grain blocks must be kept dry and at even temperatures. Minimal damping procedures for cleaning, particularly with solvents, avoid disturbing the wood texture which effects engraving after inking. Most cleaning techniques also involve obliterating both cut marks and drawing, which is a further disincentive to proofing. Although alternative materials are in use, most engravers prefer boxwood: evident in Simon Brett's remark '..the woodiness of wood has yet to find an echo in any cherishing of the plasticness of plastic.' Brett, S. (2000). Wood Engraving: How to Do It London, Primrose Hill Press. p. 134

[7] '…he even appears to have regretted its absence in books. We know that he took off light impressions of his engravings, sometimes in a warm brown ink specially for subsequent hand colouring.' Bain, I. and T. Bewick (1981). The Watercolours and Drawings of Thomas Bewick and his Workshop Apprentices. Cambridge, MA., MIT Press. p. 46

[8] Bain quoting Bewick Ibid. p. 46

wood,' adding that 'though [he] felt much difficulty…producing it, …the principle is there'.[9]

This project raised fundamental questions concerning colour printing, such as why it was more difficult than printing in black, and why black pigment was so successful as to make linear tone a substitute for colour in relief printing. In the watercolour drawing of the woodpecker and particularly in the head, Bewick drew with colour in order to depict exact tonality (**Fig 1:1c**). By making the incisions of his engraving tool evade the surface application of ink to become white lines in print, Bewick is regarded as the earliest exponent of an application which still typifies an end-grain wood or relief engraving. Bewick was familiar with white lines from boyhood, when he drew on any available paper scraps, covered any spare space on his school slate, and filled the church porch floor with chalk drawings.[10] Both slate pencil and chalk produce a paler line than the substrate, which may also have prepared him for the interpretation necessary between cutting white incisions and darker ink or pencil preparatory graphics.

Bewick remained unusual in doing his own preparatory work, and the fact that he occasionally resorted to other artists identifies an area of co-operation and collaboration which can affect the graphic outcome.[11] Who, and eventually what, prepares the printing

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[9] Bewick is explaining that early in his career he took note of a compliment he received for the 'colour' in his black and white work. Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. p. 192
Jackson expounds on the meaning of colour in black and white engraving, and the convention of referring to the 'colour' of both intaglio and wood engravings. Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p. 213

[10] '...as soon as my question was done upon my Slate, I spent as much time as I could find, in filling, with my pencil, all the other spaces of it ... before my question was given in.' 'every space of spare & black paper became filled...' after which '...I had recourse to the Grave Stones & the floor of the Church porch, with a bit of chalk...'Bain, I. and T. Bewick (1981). The Watercolours and Drawings of Thomas Bewick and his Workshop Apprentices. Cambridge, MA., MIT Press. p. 13

[11] ' ...when not dealing with subjects close to his heart ..., felt out of his depth when inventing images outside his personal experience. For an edition of Burn's Poems ... Thomas was to turn to John Thurston to make the designs.' Tattersfield, N. and J. Bewick (2001). John Bewick: Engraver on Wood, 1760-1795 London; New Castle, DE, British Library ; Oak Knoll Press. p. 30

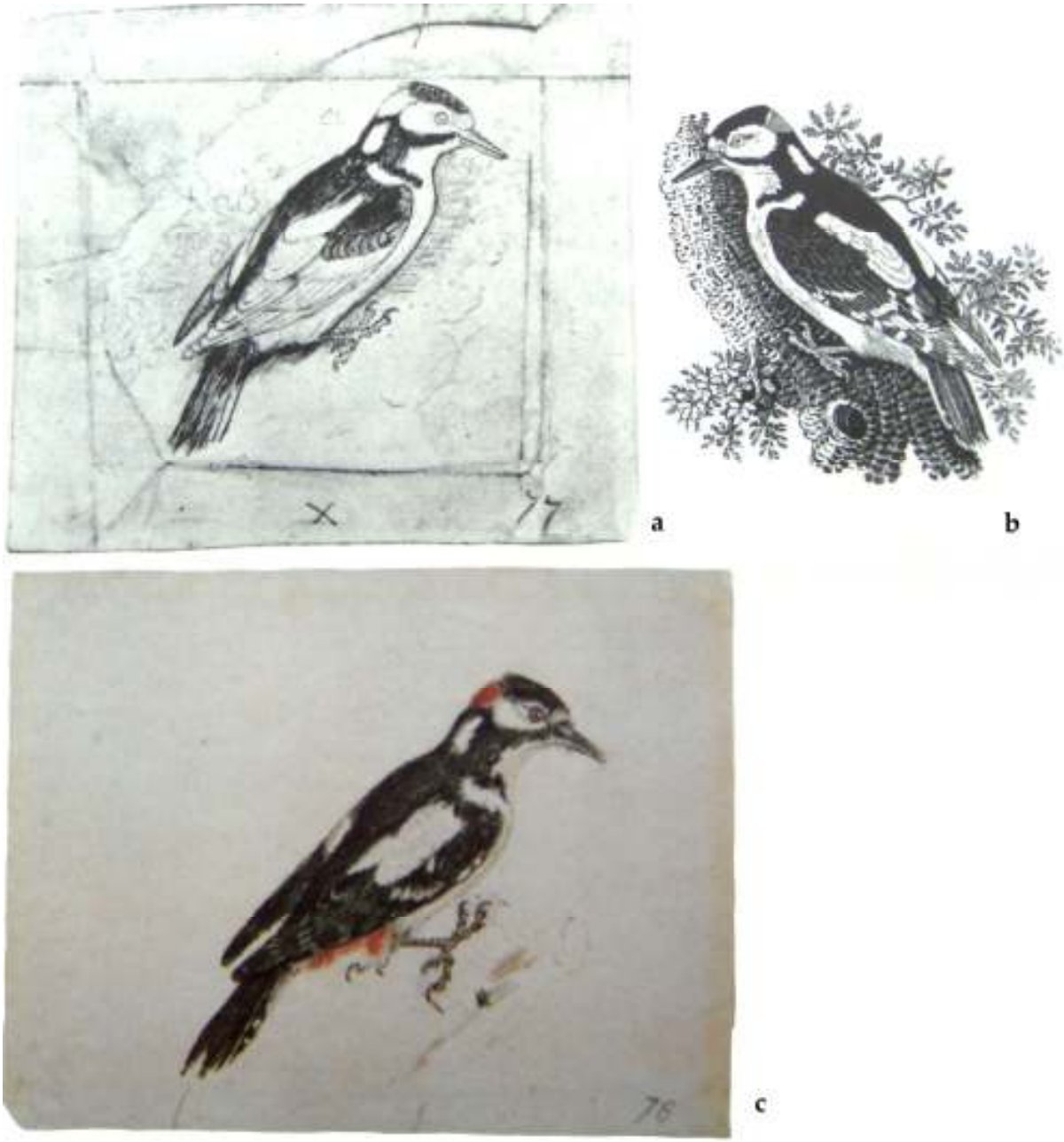

Fig 1:1 *The Great Spotted Woodpecker* Thomas Bewick (1753–1828)[12]
a) Pencil transfer drawing, **b**) Print from wood engraved block, **c**) Pen and watercolour study.

[12] Thomas Bewick *The Great Spotted Woodpecker* : Pen and watercolour study, and pencil transfer drawing: from *British Birds* Vol.I, 1797, p111. In the collection of the Natural History Society of Northumberland.' Bain, I. and T. Bewick (1981). The Watercolours and Drawings of Thomas Bewick and his Workshop Apprentices. Cambridge, MA., MIT Press. p. 27

surface, and the ways in which engravers interpreted colour and black-line graphics using relief white line, are particular concerns of my research. Whether to add greater immediacy to the relief print or simply to provide the exact lines for a reprographic engraver to avoid, direct drawing onto the sympathetic surface of wood has long been 'usual practice' as Chatto and Jackson called it in 1839.[13]

While clearly not essential, detailed transfer drawings may nonetheless prove useful to the artistic process, especially since they yield two different orientations of the image to be transferred to the block. The transfers on polymer film employed in my previous practice prefigured the entire composition (**Fig 1:6** p.11). An initial aim of my research experiments was to find alternative means to instigate a relief print. Familiarity with the potential variations of transfer orientations proved invaluable in a project which developed verso and offset printing applications. These outcomes often involve double offset prints, which mirror the effect of double negatives in text, and produce predictably clumsy explanations. However, the unexpected occurrences of reversal and inversion have produced some of the most surprising results, and are involved in the main thrust of the research project, where establishing simple technical expedients largely avoids confusion.[14]

Bewick used transfer drawings for the main areas of graphic information only, and his utilisation of both options for orientation may have depended on what he was doing. In the case of the *Woodpecker*, the watercolour drawing was in the same orientation as the woodblock, which would expedite consultation during engraving (**Fig 1:1c** p.4). Bewick habitually made 'a slight sketch, which [he] could immediately transfer to the wooden

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[13] 'the subject perfectly drawn on the block, with all the lines and hatchings pencilled in, and the *effect* and all the different tints indicated either in pencil or in Indian ink, as is the usual practice in the present day.' Chatto, W. A. and J. Jackson (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight.p.463 [See also Footnote 17 Chapter 3 p.71].

[14] A red 'sold' spot is placed on the kentō cut corner of the substrate which denotes 'bottom right face down' and is particularly useful in the studio practice of proofing on translucent paper in order to plan prints: the spot appears bottom left and uncoloured, in the correct orientation for a printed outcome.

block and so finish it from the original drawing.'[15] Bewick scribed through a ground of pencil graphite on the *back* of the transfer drawing to ensure that both block and drawings faced the same way, thus reversing only the print (**Fig 1:1a** p.4).[16]

However, in his tailpiece *An Angler on a Riverbank*, both the pencil drawing and the print are *right-reading* (**Fig 1:2** p.7). This could be achieved by directly burnishing the drawing *face down* onto the block, giving the engraver an exact, pale version of the original drawing, but its reversal would hamper consultation. For the tailpieces, it was possibly not used, as Bewick took delight in improvising where scientific verisimilitude was not necessary: a friend recalled that 'his *tail* pieces' were 'his favourite exercise':

> He does the bird as a *task,* but is relieved by working the scenery and background, and after each figure, he flies to cut an ornamental tail-piece with avidity.[17]

The *Woodpecker* further demonstrates the implications of the confined area of an end-grain woodblock (**Fig 1:1**p.4). With only rudimentary lines of the woodpecker transferred to the block, the watercolour drawing was used for consultation of colour and exactness of the bird: leaving the remaining area for engraved improvisation. The drawing nevertheless reveals how much of the main graphic image was already resolved, while the shortening of the tail on the block shows the necessity to fit the confined block area. The broken edges of both the tailpiece and the woodpecker conceal the confines of the relief block by avoiding its sharp edges. Dealing with the confines of an engraved relief block became an issue in my previous practice, and was recognised as a dilemma to be dealt with in the project.

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[15] Bain, I. and T. Bewick (1981). The Watercolours and Drawings of Thomas Bewick and his Workshop Apprentices. Cambridge, MA., MIT Press. p.56

[16] Bain (1981) cites evidence that Bewick drew anticipating this reversal as in extant transfer drawings eg of two men shaking left hands. Mirrors usually effected reversals 20th century before digital flipping. It may have been more difficult to utilise before electric light with only natural light or lamp and candle light: artists appear (possibly Hogarth?) to have preferred to reverse their drawings. Ibid. p.56

[17] Bewick's friend Dovaston, at his memorial. Ibid. p.46

Fig 1:2 *An Angler on a Riverbank.* Pencil drawing and tailpiece for *British Birds* Vol. I 1797, p.216. p.164 Vol. I *The Watercolours and Drawings of Thomas Bewick* ed Iain Bain MIT Press 1982

Fig 1:3 *Greenshank.* Pen and watercolour drawing, and wood engraved print Thomas Bewick, *British Birds* Vol. 2, 1804. From Vol II *The Watercolours and Drawings of Thomas Bewick* ed Iain Bain MIT Press 1982 p.74.

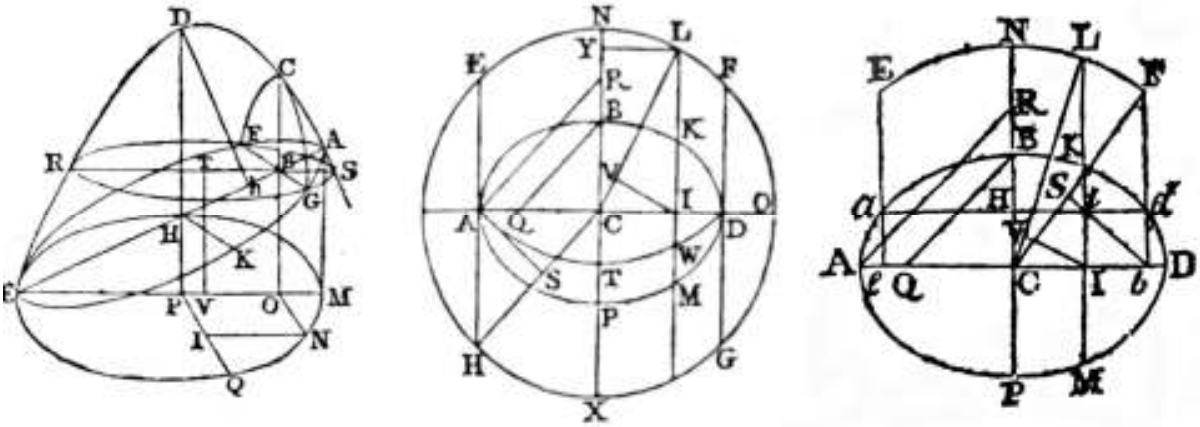

Fig 1:4 Diagrams from *Treatise on Mensuration* 1788 pp.320, 386 and 290 .

That he reportedly preferred a border around engravings may be evidence of adapting his methods to purpose: the woodblocks were set with text.[18] Bewick may have gained a solid grounding in combining engravings with letterpress during one of his earliest engraving commissions:

> The first jobs I was put to was blocking-out the wood about the lines on the diagrams (which my master finished) ...on which he was employed by Charles Hutton...It was not long till the diagrams were wholly put onto my hands to finish.[19]

The hundreds of diagrams for Hutton's *A Treatise on Mensuration* (1770), were given to Bewick, newly apprenticed to Beilby, in 1767 (**Fig 1:4** p.7). Although the workshop dealt with every variety of engraving work, it was the first large commission of engraved wood for printing. Bewick recalls that Beilby had taught him how to set up, temper and adapt tools to their diverse workload.[20] Chatto and Jackson (1861) reiterates a report that Bewick invented a grooved graver in order to cut both sides of the black lines of the diagrams.[21] This further evidence of adapting methods to purpose illuminates the role that purpose plays in graphic outcome. Innovation to suit a specific purpose for relief printing is identified in the research as a contributing factor to the development of graphic imagery, and using methods identical to Beilby's and Bewick's 'setting up'

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[18] '..it is surprising to discover that Bewick apparently favoured a bordered engraving.' according to his daughter 'my father always approved of borders around wood cuts. When in London in 1828 he and Northcote had a discussion on the subject. They both agreed that Wood cuts with borders looked best.' Ibid. Bain p.46

[19] p.47 Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. *Setting up* tools is the expression used for the process of shortening and grinding an edge tool and attaching a handle to suit a particular practitioner's hand size.

[20] Jobs included: 'coarsest.. steel stamps, pipe moulds, bottle moulds, brass clock faces, door plates, coffin plates, bookbinder's and letter stamps, steel, silver, and gold seals, mourning rings, etc.' 'engraving of arms, crests, ... cyphers ...every kind of job from silversmiths; also ...bills of exchange, bank-notes, invoices, account heads, and cards.' Bewick claimed he tackled all jobs excluding polishing copper plates 'cheerfully' and to the best of his abilities. As he regarded all but his tail pieces as jobbing to some extent, he may not have seen the diagrams as such an onerous task as historians assume. Ibid. p 47 -48
'they provided little more than an exercise in care and accuracy for the young apprentice.' Bain, I. and T. Bewick (1981). The Watercolours and Drawings of Thomas Bewick and his Workshop Apprentices. Cambridge, MA., MIT Press.p.15

[21] Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p.475

strategy, the project has involved the modification of nineteenth-century tonal engraving tools.

Thus clearing the white spaces around numerous black-line diagrams might have heightened Bewick's awareness of engraved white space, and indicated ways of breaking the boundary of the wood. The onerous operation of making negative space demonstrates how much of the labour of white-line engraving is hidden. Bewick demonstrates this by pointing to the converse ease with which 'the plain surface of the wood will print as black as ink and balls can make it, without any further labour at all.'[22]

Taking two years, the execution of Hutton's diagrams could have influenced Bewick's future treatment of his engravings, notably his favourite tailpieces, by also honing his ability to enliven the cramped available space.[23] His tailpiece blocks were often roughly elliptical end-grain slices of untrimmed boxwood.[24] As the confines of the relief block had become an issue in my previous practice, and efforts were made to reconcile the potential dominance of the printed edges, as in *Drillbit* (1996), an early priority in the research was to find other ways to break the uncompromising boundary of the engraved block (**Fig 1:5a** p.11). The solutions, involving offset printing and the devising of differently shaped substrates, are expanded in Chapter 5: Development of the Modular System.

Bewick's diagrams have relevance to the research: they were produced using largely identical methodology to that used for more recognisable examples of wood engraving. It is a legitimate, if functional, product of the process, albeit imitating a pen and ink drawing: but is not as detectable as illustrative white line wood engraving. Imitation of other media necessitates a degree of invention, as Bewick's tool adaptation for black line diagrams shows. Throughout the historical investigation it has been noted how imitation

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[22] Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. p.191

[23] Hutton's work continued from 1768 to 1770 and came out in instalments. Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p.475

[24] Bain, I. and T. Bewick (1981). The Watercolours and Drawings of Thomas Bewick and his Workshop Apprentices. Cambridge, MA., MIT Press. p.58

– of other printing and graphic processes, and eventually even other inventions – has stretched the possibilities of relief engraving. The diagrams exemplify how the hidden and overlooked use of relief engraving, with which the project work identifies, has directed the research to functional uses of relief printing.

Bewick's words help explain aspects of the previous practice and predict processes which are exploited in the research, particularly regarding tonal engraving. His explanation of tonal engraving encapsulates the particular characteristic of the wood engraving process which was embraced by my previous work and which, since 1983, has been combined with colour – in a manner also anticipated by Bewick. His postulating on applications for engraving that he had run out of time to pursue includes concepts of the Modular System constructed in the project.

A personal and enduring attraction of the relief engraving process remains its particular manner of generating a tonal gamut through the use of increasingly wider tools. In 1787 Bewick wrote:

> ... it may easily be seen that the thinnest strokes cut upon the plain surface will throw *some light* on the subject or design: and, if these strokes are made wider and deeper, it will receive more light: and if these strokes, again, are made still wider, or of equal thickness to the black lines, the colour these produce will be a grey; and the more the white strokes are thickened, the nearer will they, in their varied shadings, approach to white, and, if quite taken away, then a perfect white is obtained.[25]

With the aid of a spread of tint-cutting tools, the utilisation of a linear tonal system has particularly informed the previous work. A selection of nineteenth-century engraver's tools was acquired in 1977 from a surviving trade engraver.[26] It contained enough straight line-making tools of varying width to indicate the potential of a tonal system. The range was gradually supplemented by new tools in order to implement a precise

[25] Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. p.191
[26] Mr Frampton in Clerkenwell Road, London

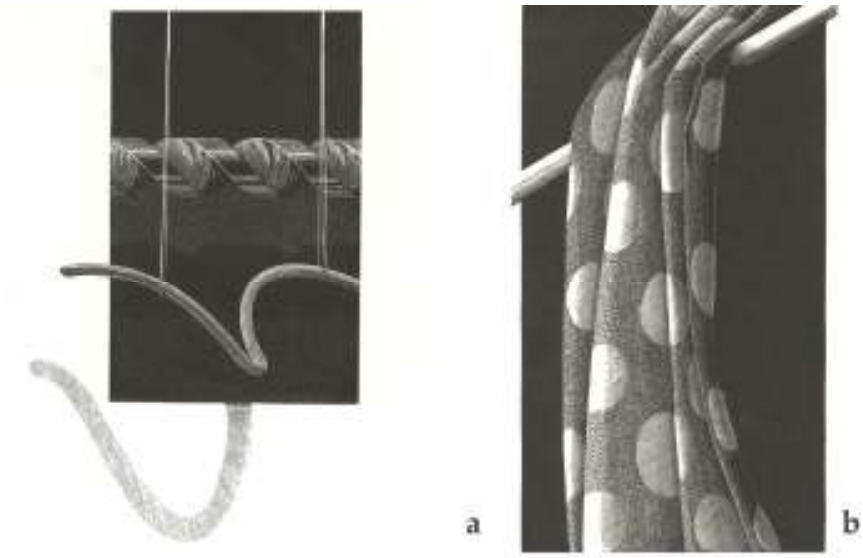

Fig 1:5 Breaking the boundaries: relief engravings on acetal resin. **a**) *Drillbit* 1996, **b**) *Spots* 1995.

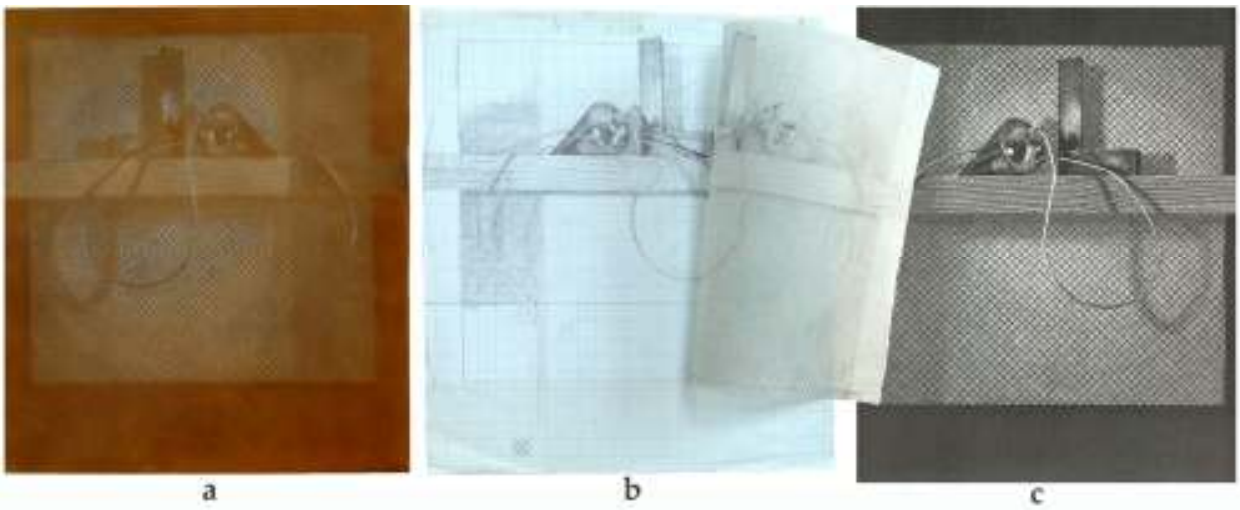

Fig 1:6 *Plumbob on Shelf* 1994 **a**) Acetal resin block, **b**) pencil drawings on paper and transfer film, **c**) print.

tonal gamut with no incremental gaps. Approximately ten of the spread were used for the background of *Plumbob on Shelf* (1994) (**Fig 1:6** p.11). The block and transfer drawings show that, unlike in Bewick's practice, the entire graphic image was pre-destined, with only the exact tonality left for interpretation by the tools (**Figs 1:6a, 1:6b**). While the transfer method is the same that Bewick used for his tailpiece (**Fig 1:3** p.7), further potential is possible with the use of modern materials. For example, the translucent polymer tracing film, rather than the original pencil drawing, has become the final resolution drawing. As a sympathetic surface for graphite, it was worked up with the

still-life, before burnishing face-down onto a dyed acetal resin wood-block substitute: a material that has been configured and engraved since 1986, and exclusively since 1988.[27] Acetal resin takes a fine pencil transfer from the film, which is afterwards turned over to show the drawing visible in reverse. It supplies a more immediate consultation, during engraving, than the set up still-life which is reversed to the block image.

Bewick anticipated the result of the application of colour to his tonal concept: 'There is another way, not yet entered upon, of similar import to the foregoing, in which prints might with good effect be made ... that is from wood blocks printed in colours'. Since 1983 I have used the same methodology as *Plumbob on Shelf* to engrave reds, yellows and blues on separate blocks to generate colour relief engravings (**Fig 1:6**p.11).[28]

In *Afternoon, Bollards Lagoon* (2001), the working drawing from watercolour pencils again resolves most of the imagery – leaving the tools to interpret the precise tonality of the consistent colours, which overprint to mix a third colour both physically and optically (**Fig 1:7c** p.13). The detail shows how red and yellow blocks mix orange Outback dirt (**Fig 1:7e**). This method of generating colour has remained a consuming interest in my work and has been developed in the project as a means of generating larger areas of colour than the descriptive and narrative uses that my previous practice allowed. I have found that the few practitioners who have utilized engraved multiple colour relief blocks rarely relied upon colour generated purely by overprinting, and suspect that this infrequency was probably linked to the protraction of proofing time necessary and possibly also to difficulty with pigments.

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[27] Generic name for copypolymer and homopolymer.

[28] Engraved colour was inspired by North African light. Ellis, E. (1987). "A Moroccan Diary." Matrix No. 7 16-18.

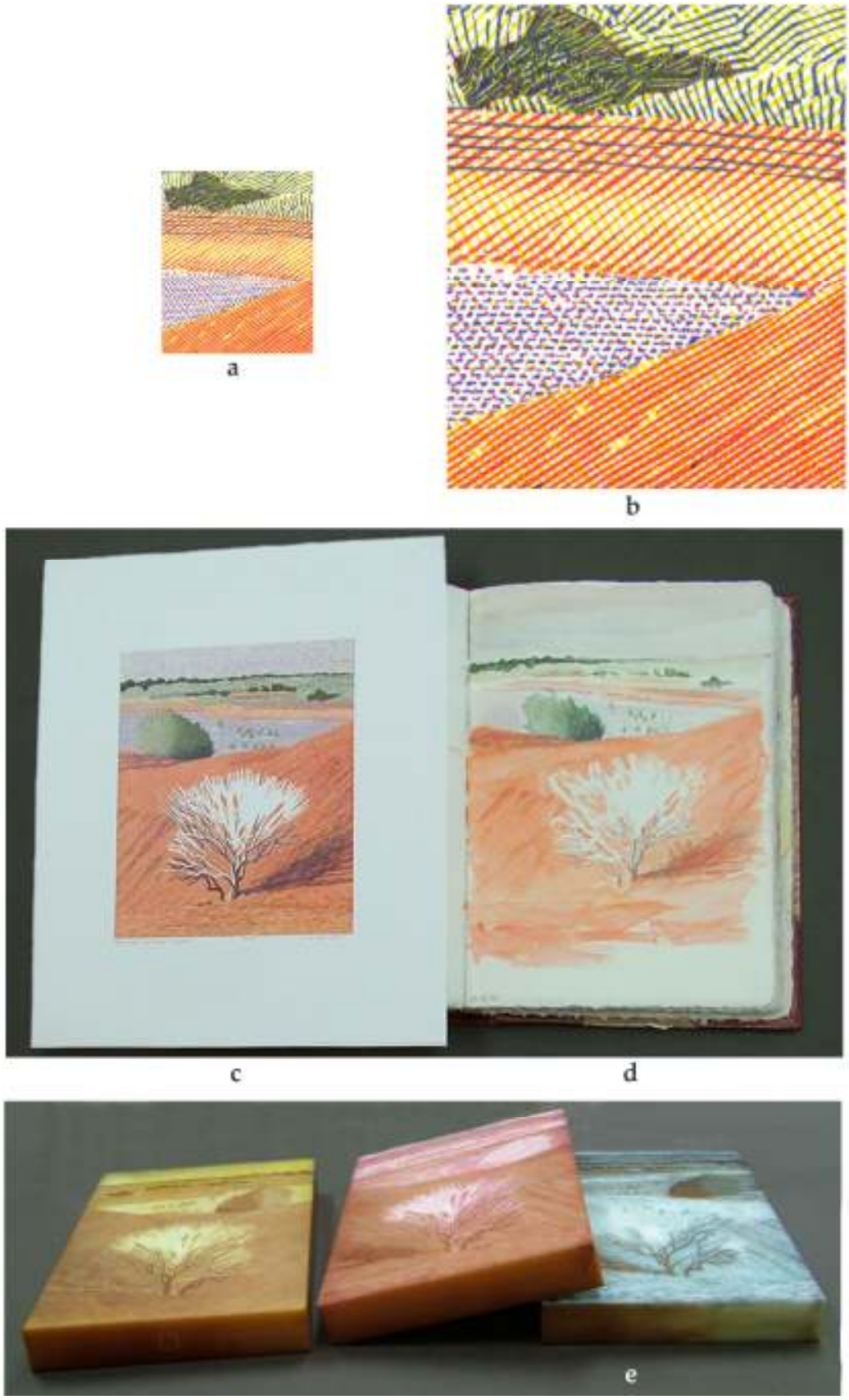

Fig 1:7 *Afternoon, Bollards Lagoon.* Colour relief engraving.
a) detail actual size, **b**) detail enlarged to show optical mixing of colour,
c) print, **d**) watercolour pencil drawing, **e**) acetal resin blocks.

Fig 1:8 *Elegy in a Country Churchyard* 1869 unspecified artist, printed by Cooper & Clay p.9.

Fig 1:9 *Cordyline dracaena indivisa* Benjamin Fawcett 1861 from *Beautiful Leaved Plants* p.107.

Fig 1:10 Birket Foster, tailpiece printed by Edmund Evans, from *Sabbath Bells: Chimed by the Poets* 1858 p.59

The sparse output of the printing firm Cooper and Clay (1866–72) may be a case in point: producing only two volumes, it was associated with the wood engraver James Davis Cooper (1823–1904). He used 'a considerable number of blocks...which unfortunately, tend to be on the violent side.'[29] The illustration from Gray's *An Elegy Written in a Country Churchyard* (1869) demonstrates a degree of colour generation by overlaying over a faint linear key (**Fig 1:8** p.14).[30]

The skill in colour manipulation of the Driffield firm of Benjamin Fawcett (1808–93) included careful uses of overprinting. Fawcett produced colour engravings for publishing between 1831 and 1895, mainly with hand platen presses.[31] In addition to devising particularly successful coloured inks, which show the influence of William Savage (1717–1843), Fawcett was a sympathetic collaborator with artists and illustrators. For thirty years he employed Frank Lydon (1836–1917), a talented draughtsman and colourist, who drew and colour supervised *Beautiful Leaved Plants* (1861).[32] The illustration and detail show how well he could 'analyse the primary colours in the image and decided on values and intensities, and consider how they could be combined in varying proportions to create necessary secondary colours' (**Fig 1:9** p.14). A characteristic of Benjamin Fawcett's work that has particular relevance to my continuing studio practice is that there is 'no discernable key block as understood by contemporary practices.'[33]

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[29] Wakeman, G. and G. D. R. Bridson (1975). A Guide to Nineteenth Century Colour Printers. Loughborough [Eng.], Plough Press. pp. 28, 38

[30] The volume does not specifically credit the illustrations, but the illustration list states 'from Drawings by R Barnes, R.P. Leich, E. M. Whimperis, *and others*.'
Gray, T. (1869). An Elegy Written in a Country Churchyard. London, Sampson Low, Son, and Marston.

[31] Among the item sold at auction on closure of the firm in 1895 were eight platen presses including five Albions.. Wakeman, G. and G. D. R. Bridson (1975). A Guide to Nineteenth Century Colour Printers. Loughborough [Eng.], Plough Press. P. 40

[32] *Cordyline dracaena indivisa* Lowe, E. J. and W. Howard (1861). Beautiful Leaved Plants. London. op.p.107

[33] Fawcett did use a faint brown or grey under-block sometimes. McLean, R. (1988). Benjamin Fawcett : Engraver and Colour Printer with a List of his Books and Plates. Aldershot, Scolar. p.p. 11-18

Edmund Evans (1826–1905) had a diverse and commercial output for over fifty years from 1851, lasting well beyond the mainstream uses of commercial wood engraving.[34] He employed up to thirty engravers to produce colour printed wood engraved covers for the new Railway Bookshop publications in addition to illustrations from artists such as Kate Greenaway, Randolph Caldecott, Joseph Cundall and Birkett Foster. Foster's tailpiece from *Sabbath Bells: Chimed by the Poets* (1858), typifies Evans's careful treatment of his artist's work (**Fig 1:10** p.14). To follow a pull from the main tonal block hand-coloured by Foster 'as faithfully as [he] could', Evans sourced and hand-ground quality pigments for the ink.[35] The tailpiece shows how Evans used overlaid colour mixing judiciously.[36] His own words explain the process, its application and his motive in employing it – particularly concerning the book covers:

> The popular artists of the day were asked to supply drawings which were engraved on wood; then two 'transfers' from the engraved block i.e. impressions while wet were laid face down on plain blocks, then through the press so that the wet impression was 'set off' on the plain block and used, one for a *Red* printing, the other for a *Blue* printing, the red being engraved in gradation to get the light tints, such as faces, hands, etc.-- the blue block being engraved to get the best results of texture, patterns, or sky, crossing the blue over and the red to get good effects of light and shade…There were generally only three printings used -- black, blue, and red, or black, green and red: the very most was made of each block by engraving so as to get the best results for the money![37]

Would Bewick have been prepared for how different the application of his theory would look from a 'traditional' wood engraving? The historical research has revealed that the exploitation of the relative difficulty of detecting or imitating colour relief engraving, particularly for security printing, produced graphic imagery that is relevant to the project.

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[34] McLean in forward: 'When he died in 1905, the days of the commercial wood-engraving firms were over; books, magazines, and newspapers were illustrated with photographically prepared and chemically etched zinc process blocks. 'Evans, E. and R. McLean (1967). The Reminiscences of Edmund Evans. Oxford, Clarendon Press. p. vii

[35] MacLean is quoting from an unpublished letter from Evans to Joseph Cundall. Ibid. p.xiv

[36] Fried man specifically states that Evan was known for not overlapping colour – see Chapter 2 Chevreul. Friedman, J. M. (1978). Color Printing in England, 1486-1870: an Exhibition, Yale Center for British Art, New Haven, 20 April to 25 June, 1978. [New Haven], Yale Center for British Art p. 38

[37] Evans, E. and R. McLean (1967). The Reminiscences of Edmund Evans. Oxford, Clarendon Press. pp. 26 27

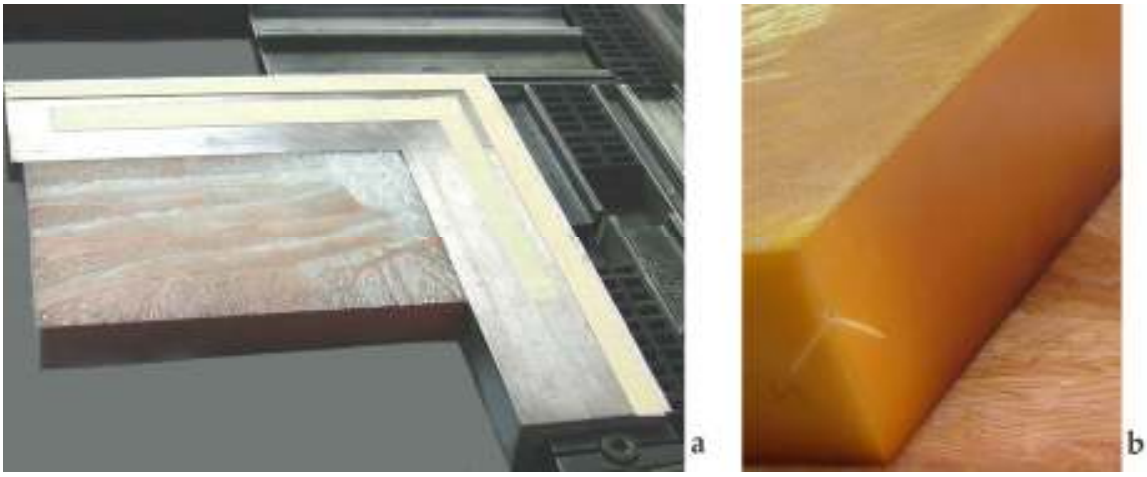

Fig 1:11 Registration: **a**) type-high steel *kentōban* locked into press bed, **b**) block registration mark

It also revealed that the essentially basic relief printing processes contributed to its ultimate failure to deter counterfeiting.[38] Even multiple block colour printing proved too simple: the main technical difference to single block printing is block registration.

Registration strategy has proved a rich ground for innovation throughout the history of relief colour printing, but Chinese and Japanese methods are relatively simple. For colour blocks, I embraced the simplicity of Japanese registration, combining it with letterpress practice. A type-high steel right angled *kentōban* was designed to lock into the press and was made by Leon Rochat in 1984 (**Fig 1:11a** p.17). All the blocks have a marked registration corner and are placed in the angle of the *kentōban* to register in the same manner as the more usual Japanese *kentō* marks cut into the body of a woodblock (**Fig 1:11b**). During the research, the *kentōban* system was developed into a diverse planning, placing and drawing strategy. This use of a routine procedure that is generally employed to advance the graphic invention of printmaking without directly contributing to it typifies the developments which occurred in the project. Examples are offsetting, which

[38] 1821The Bank of England's 25 year search for a counterfeit-proof currency note ended when Applegarth and Cowper failed to produce, even with a five block coloured note both directly printed and offset printed on the reverse, that Bawtree, the Bank of England printer, could not imitate Mackenzie, A. D. (1953). The Bank of England Note, a History of its Printing. Cambridge UK, University Press. . p78

evolved into a process from transferring strategy for multiple block colour prints, and maculature, which is usually a cleaning expedient.

The *offsetting* method devised for transferring imagery is so straightforward that it independently occurs to many printmakers involved with multiple blocks.[39] It has been noted that offset transferring is generally understood and utilized by those who need the expedient, which is generally for colour multiple blocks, and that the resultant double-negatives render comprehension harder in theory than in practice. Offsetting to transfer the image from a printing block onto subsequent blocks – in the correct, reversed orientation – is employed in the studio in a way almost identical to the method described by Evans. The refinement of a process to ensure that the blocks also overprint in register is more likely to have been omitted in his writing than in his practice.

In my studio, the *kentōban* has the wet ink impression taped to its surface, and the first engraved block is removed: to be replaced by a blank block before the platen is brought down to print the offset onto the blank block. Register is assured by nestling the block into the *kentōban* corner. Thus multiple-block use can familiarise a printmaker with offset printing, and it has been developed during the research project into a process that particularly expands the potential of the Modular System. The development is described in Chapter 5: Development of the Modular System.

Offsetting with registered accuracy joins the list of operations – including overprinting, multiple colour progressions and proofing – which are expedited by the use of a press. Although the printing of multiple block colour engravings is possible using Japanese and Chinese hand printing processes, they were developed for water based pigments and inks. As oil based inks demand greater pressure, their use, as in the previous and present studio practice, renders hand-printing for multiple block imagery only feasible, and

[39]A notable exception is Claude Flight, who advocates a complicated tracing operation involving a key-block print, but not offset. Flight, C. (1934). The Art and Craft of Lino Cutting and Printing. London, B.T. Batsford, ltd. p.38-9

realistically not practicable. The colour engraving *Afternoon, Bollards Lagoon* could not have been developed without the constant, additional and easily variable pressure from a platen press (**Fig 1:7** p.13).

The association of wood engraving with metal type continued into the late twentieth century with the private press movement. Printers still commissioned artists to make illustrations which locked into the press with their type. Michael Mitchell (1939-) of the Libanus Press would show interested wood engravers how to manipulate tonality at the press in the historical operation still called *making ready*.[40] *Make-ready* is achieved by manipulating pressure over areas of the image without impressing through to the back of a paper substrate – which historically, may typically have been a printed book page. Without such knowledge, the subtlety of the tonal spread of the tools used in the previous practice would have been lost, but the experience also supplied impetus for the initial project experiments: to find out how far and how deep the application of *make-ready* could go beyond its traditional use. These experiments led directly to embossing and trials with contemporary foam overlays, and eventually, to a change in the role of the press. Whereas previously it had been an essential tool to ultimately realise a print from a block already prepared by engraving, the platen press takes a central role in the project and the working of the system, where its use is involved in the generation of graphic imagery for printmaking. The basic principle of a platen press has hardly changed since its evolution in the fifteenth century,[41] but the consistency of contemporary materials compared to the historical vagaries of ink and paper may have contributed to the continuing difficulty of colour printing until the last century.

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[40] 1983 in the process of printing a small book *An animal alphabet*, lessons were given on press work. Make ready is explained in Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications. pp 269 - 277

[41] Stanhope's metal version 1813 is considered the most mechanical change but did not affect the basic process. Nuttall, D. (1973). A Brief History of Platen Presses. S.l., D. Nuttall].

My previous colour engravings were printed on dry paper specified by their particular demands and is a *special making* of paper from the Zerkall mill in Germany. Configured by John Purcell since 1987, his attention to the problems of producing an extremely smooth, hard-surfaced and consistent product is further evidence of the degree to which contemporary printmakers have benefited from generously given outside expertise and assured consistency of materials.[42] By contrast, paper for fifteenth-century printers was thick, its sizing varied, and the quality was so uneven that a paper supply necessitated sorting in order to gain any semblance of quality or constancy.[43] Paper continued to universally require damping for relief printing even up until the nineteenth century.[44] That paper can be relief printed either dry or damp is exploited in the project, the resultant implementations of processes which are more successful with the use of damp paper include offsetting, embossing, de-bossing and variations in the results for maculature: detailed in Chapter 5: Development of the Modular System.

Similarly, with ink, protracted development and experiment with colour has been possible with the availability, cost and range now available to artists. In marked contrast to pre late nineteenth-century printing, today inks are available for specific purposes, in single pigment tins or tubes and with light factor information as standard. The previous difficulties of making and maintaining colour in inks have informed much of the research, and have raised most of the questions unanswerable in the present context.

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[42] John Purcell, supplier of paper to artist printmakers, generously organised a paper suitable to print in this manner without recourse to damping: the result '*Edwina Ellis Special Making Zerkall* has been in production since 1987. As Purcell has found it answers for most wood engravers, it is now a stock product and in its 5th making. The extra calendaring to produce a hard smooth surface has been problematical as it is highly susceptible to climate and conditions: to succeed the operation is sometimes delayed for cool winter months.

[43] Landau, D. and P. Parshall (1994). The Renaissance Print: 1470-1550. New Haven; London, Yale University Press. p. 20

[44] Savage's translation of Papillon. From the directions, paper for relief printing also required considerably more soaking than is necessary with modern papers for letterpress Savage, W. (1822). Practical Hints on Decorative Printing. London. pp 91-98

Fig 1:12 Design for England One Pound Coin 2004: **a**) black linocut, **b**) print, **c**) plaster model by Royal Mint engraver Claire Aldridge.

The blocks for *Afternoon, Bollards Lagoon* were engraved over two months, with proofing and printing taking a further three weeks: time which had developed into a vexation (**Fig 1:7e** p.13). Linoleum, as a substrate which used broader, hollow tools, was a welcome addition to the studio oeuvre in 2003. It was employed to produce a series of designs for One Pound coins for the Royal Mint (**Fig 1:12** p.21). It became clear that a stronger graphic black and white design cut in lino would furnish the requisite broadness in the eight times scale required, and also facilitate a number of alternative designs in the allotted time. The final linocuts for the minted coinage involved cutting a design that would be realised in plaster bas-relief, (**Fig 1:12c**). The experience generated new interests in embossing, and in working on a circular substrate. In the project, it is this recent joy in the broadness, flexibility and applications of lino that is balanced by the long association with wood engraving tools and their use for engraving acetal resin.

Saving time is a frequent motivation for introducing new techniques, materials and procedures: particularly with colour relief printing. Demands of time also appear to remain a principle deterrent to the use of colour. Bewick ran out of time towards the end of his life, to finish his planned multiple blocks for *Waiting for Death*, and it remains a

single block print.[45] However he outlined the principle of overprinting sets of parallel lines from two blocks late in his *Memoire* (1887) while recalling a youthful experiment:

> ...any artist may see this in a few minutes, by cutting parallel lines on a piece of wood, and from it taking, by his hand, an impression on a piece of paper, and then again inking the same cut, and printing it in the same way, either directly in a cross or in an oblique direction, upon the first impression. This can also easily be done, from two cuts, at a printing press...[46]

Although Bewick dismissed the concept as 'a thing of no use at all', it was in the context of its application for imitating intaglio cross-hatching that he began to exploit the process for other purposes. An example of a similar separation of purpose from practice is evident in the project where some of the mechanisms of trade and reproductive engraving are harnessed for an alternative purpose. A graphic method can continue to attract the opprobrium due to this combination of purpose and practice: the style of mark making thus branded, its use has the element of a challenge. That Bewick notes the simplicity of the concept, which had also occurred to Papillon for different purposes**,** is evidence of the basic simplicity of relief printing methods – and it also anticipates the function of engraving work in the project.[47] The concept describes both the fabrication and the role of the tint blocks which form half the printing surface components in the Modular System described in Chapter 3. A tint block has been rotated exactly as Bewick describes for *Pole Apart Left* (**Fig 1:13a** p.23). Bewick's 'two cuts' concept explains how the same block has been used to print blue over a second yellow block for *Good Gum Green Left and Right* (**Fig 1:13b**).[48] The rotational action of the circular chases devised in the project and outlined in Chapter 4 (Printing) is also anticipated by Bewick's description. Thus as Bewick's work introduces wood engraving as well as some of the

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[45] Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. pp 465, 506

[46] Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. p.190

[47] Papillon recommends it to avoid ink clogging for cleaner printing Papillon, J. B. M. (1766). Traité Historique et Pratique de la Gravure en Bois. (Supplément ... Tome Troisième.). Paris. P.74

[47] Other processes employed for these prints: embossing and verso de-bossing, maculature and offsetting, are introduced in Chapter 2 'The Modular System' and expanded in Chapter 5. The compound printing surfaces employed are explained in Chapter 3 'The Printing Surfaces.'

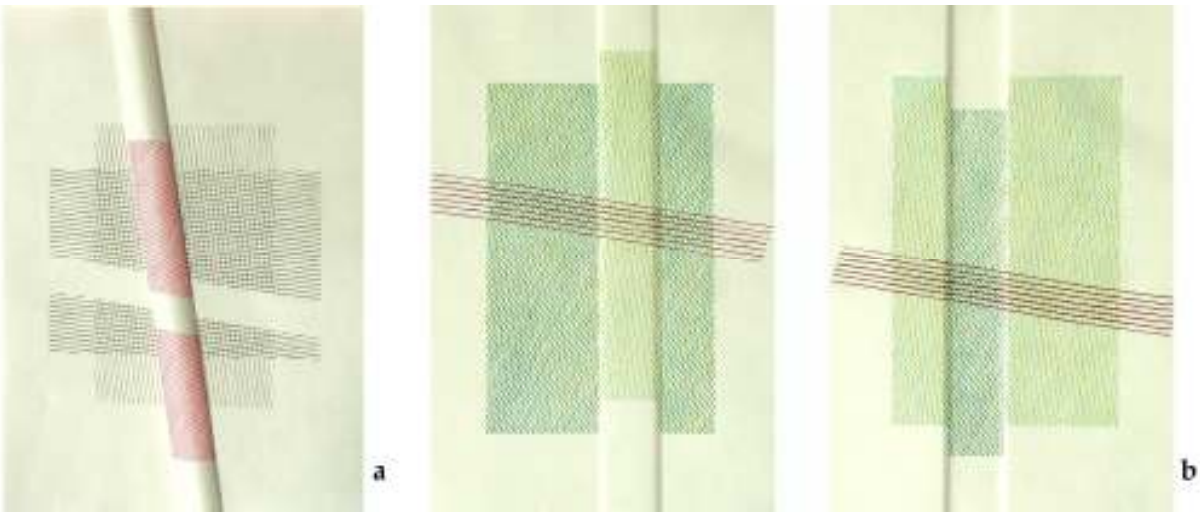

Fig 1:13 Tint block 28: **a**) rotated for *Pole Apart Left* 2007, **b**) printing blue in *Good Gum Green* 2007

concepts and processes upon which the system is based, it can be seen that what perceptibly represents an artist or printer in graphic outcome belies other inventive and *invisible* innovations or graphic inventions they may have had. What would Bewick have made of lino?

The fact that Bewick's exact words could introduce principles and processes central to this project drives home how historical research, rather than being distinct from art practice, can influence, inform and renew it. Bridging gaps between practice and theory has furnished the most vexing, but also some of the most amusing moments in the project. Writing about orientation continues to present a bigger problem than marking a corner of a proof to denote *'bottom right face down'*. Terms such as *maculature* continue to amuse: learned years after its establishment as an expedient and as a process in the studio, an ongoing straw poll indicates that many printmakers use inkless or wiped reprints, but have at best only vaguely heard of the term.[49] The steel *kentōban*, previously dubbed 'Klunk' for its type-high bulkiness (**Fig 1:11** p.17), got its proper name after Rebecca Salter published *Japanese Printmaking* in 2001 – but has seen its eponymous silver anniversary in the studio.

[49] Both Anne Desmet and Gail Broadholt, 2008 relief printmakers, stated use but did not know the term. Paul Hawdon 2009 employed intaglio *maculature* a vague notion of the term. Simon Brett teaches traditional cleaning expedient for wood engraved blocks without the term. See also Chapter 5 maculature.

Impetus, Inspiration and Precedents

The ultimate aim of the research was to find a working methodology that could respond to the demands of contemporary printmaking more effectively than my previous printmaking practice, which employed traditional wood engraving processes with a relief platen press. However, the generation of colour – by overprinting engraved tints for optical and physical subsidiary colour mixes and the exploitation of tonal engraving, both of which informed my previous work – has also been central to the development of the project. Familiar processes gave impetus to the research, but their limitations instigated the experimental work. The confined area available to a wood engraver and the time required to produce multiple block colour engravings had become discouraging: the questions of how to utilise colour and tone generated by engraving and how to move out of the constraints of an engraved relief block directed the initial research for this project. The idea of a system where engraved tint-blocks could generate tone or colour in larger areas and be applied to more than one image grew out of further questions raised during early experiment. Could a system enable such paradoxes as repeatable monoprints, or non-identical print editions?

Using interlocking copper plates, I first developed the concept of an interchangeable system in my MA study; but I returned to relief printing after experimenting with intaglio processes (**Fig 2:1** p.25). Etching brought promise, possibilities and ideas which outran technical knowledge. It was the universal embossing of intaglio plate edges which engendered the concept of applying the familiar principles of *make-ready* to select and manipulate embossed areas with a platen press. Familiar processes had the potential to take research deeper than recently learned processes and more efficiently realise the ideas of an interchangeable system. However, the use of copper and intaglio, with processes devised in the system, has also remained a potential area for future research. **Fig 2:1a** shows the intaglio plates already trimmed to the template size for integration with the Modular System. The intaglio precedent for transferring graphics between printing surfaces in Gabor Petedi's *Printmaking* (1971) is the only reference found for

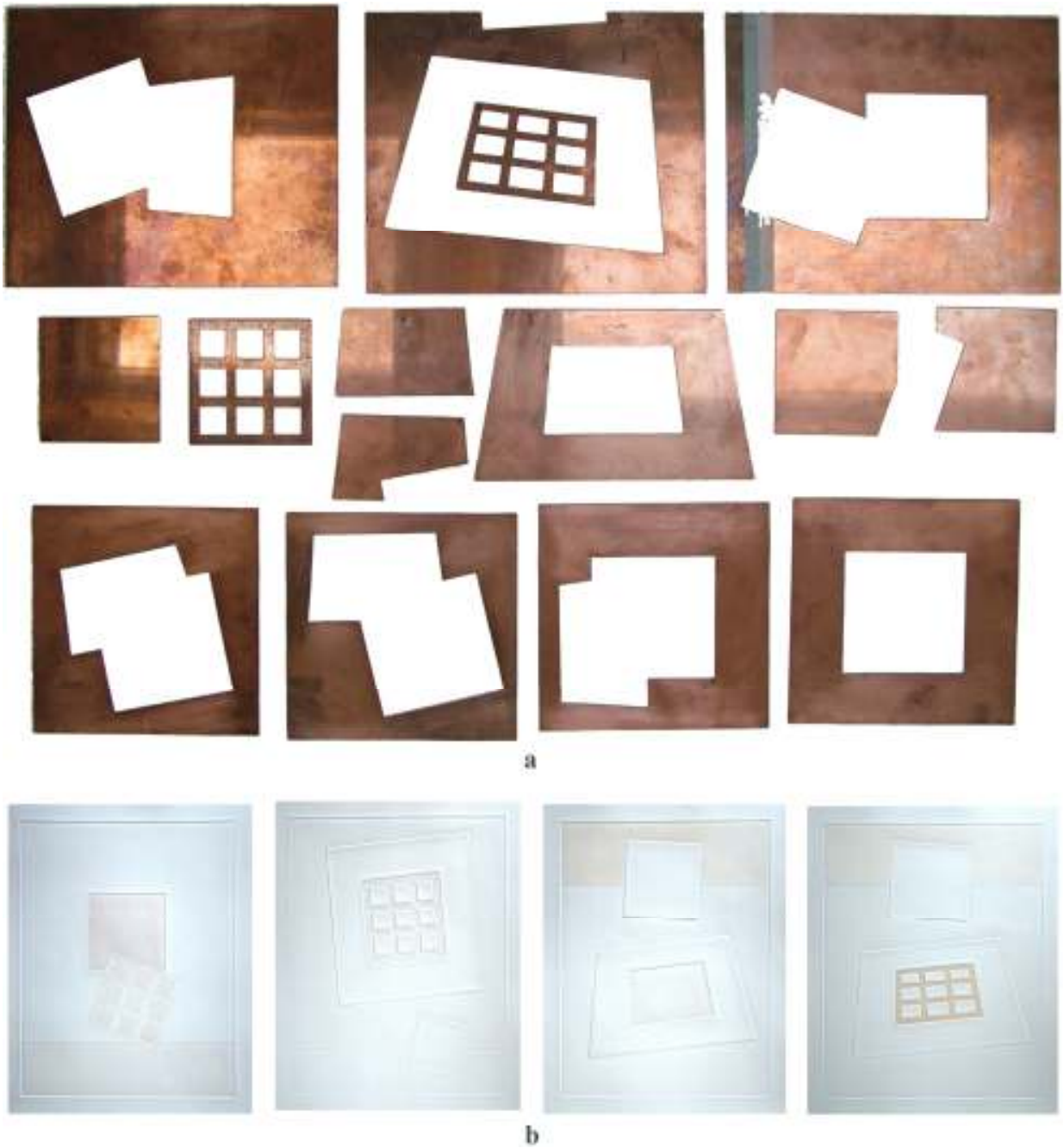

Fig 2:1 MA study 2005 **a**) Interchangeable copper plates. The larger plates on the top row have been modified for integration with the modular system. **b**) Prints from the plates.

such a process in either printing medium.[1] However, *printing* a printing surface could broadly describe Siderography, a method of replicating intaglio plates for security printing invented by Jacob Perkins (1766–1849). Siderography involved impressing a hardened steel intaglio engraving into softer steel. The impression was subsequently case-hardened to form a second steel intaglio printing surface.[2]

The Modular System consists of interrelating printing surfaces and printing devices for making relief prints. Its function enables the generation of tone or colour in larger areas, which are applicable to more than one image. This has been achieved by devising tint blocks from acetal resin in various sizes and shapes that resemble tint-cutting exercises from nineteenth-century engraving print manuals. They are combined by offset printing and transferring, with segmented and joined compound linoleum or vinyl blocks with removable parts. The imagery created by printing these surfaces together has driven the experimental project that will form the core of the exhibition component of my PhD submission. Placing, overprinting and moving the printing surfaces around the printing area have been facilitated by the flexible compound substrates. The printing surfaces interact with press furniture that has been devised for the project, including a series of *kentōban* and a set of circular chases. A specific platen press is the basic control of the modularity of the system and the maximum printable area of its platen has defined a size into which all components of the system fit. The components featured in **Fig 2:2** (p.27) are **a**) compound matrices, **b**) *kentōban* and tint blocks, **c**) circular chases and tint blocks, **d**) a tint block, linoleum components and a large linocut. It shows how they all measure, fit, or are configured to fit into the final template size of 228 x 278mm. The components are explained in chapters 3 (printing surfaces) and 4 (printing).

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[1] Peterdi, G. (1971). Printmaking: Methods Old and New. New York London, Macmillan Collier-Macmillan. p.230 and illustrated VIII23

[2] An American, Perkins entered the Bank of England competition in 1819 and produced country banknotes and postage stamps with his firm Perkins and Bacon. Mackenzie, A. D. (1953). The Bank of England Note, a History of its Printing. Cambridge UK, University Press. pp. 33–35.

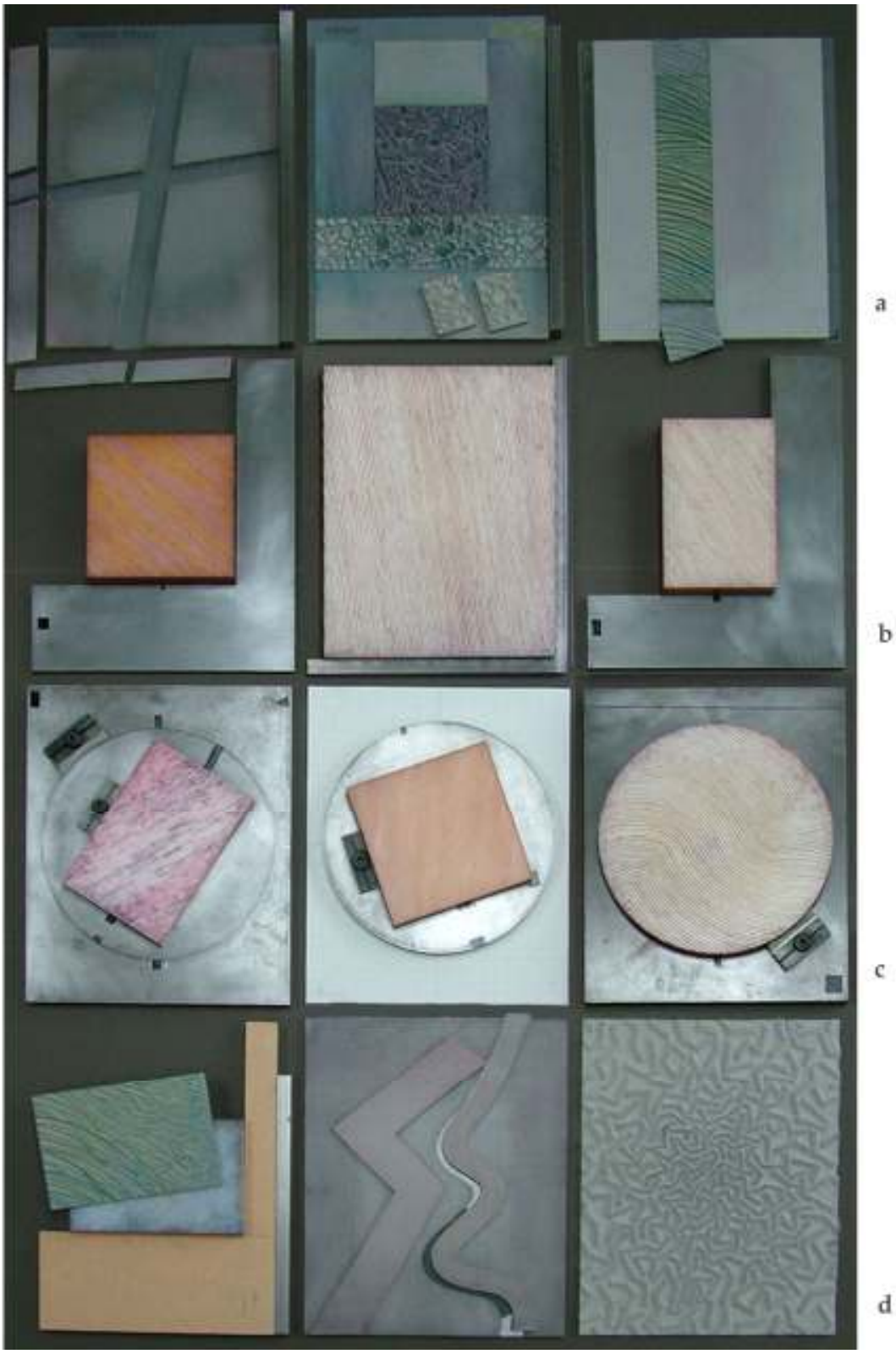

Fig 2:2 The Modular System standardization to *Template Size* **a**) linocut Compound Matrices, **b**) acetal resin Linear Tone blocks in *kentōban*, **c**) the acetal resin blocks in circular chases, **d**) linoleum surfaces showing diverse sizes and treatments: cut to block size, left smooth, and a template-sized linocut.

In order to devise a system that facilitates exact repetition of specific processes, some degree of standardization of the component parts is necessary. The outside measurement of the maximum printing surface sets a basic standard for the system. All the components of the system share, fit, or match this single dimension, called the *template size* for the purpose of the project. It corresponds to the minimum possible paper substrate size of the final prints. The exact height and width has evolved thrice during experiments, and has been determined by a number of factors: the most fundamental of which is the maximum printing-pressure capacity possible with a specific platen press, and which is determined by the *platen* size. The area on which it is possible to exert maximum pressure is roughly one quarter of the platen size. Thus the final working template size of 224 x 278mm is directly related to the size of the Albion 16 x 21 inch platen press used in the project.[3]

The simplicity of using an outside measurement to control and minimize potential technical complications outweighs any sense of restriction by a single dimension. The final template size has been determined by the largest acetal resin blocks together with later developments with circular blocks and chases. Thus a standard outside maximum paper measurement is the basic control of the modularity of the system and has been established by the requirements of the system and its function with a specific platen press. The implication of devising a system exclusively for one press has minimal drawbacks. A smaller platen would not apply consistent pressure to the template size margins: a larger platen would require less pressure and expedite a similar result.[4]

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[3] Platen sizes are measured in inches, and the devised system is metric: there is no recourse to letterpress or typography measurements in the system. For comparison, Platen: 21 x 16", *paper size* approximately 11 x 9". The central area of the *paper size* is mainly used, which is under the staple of the press and receives the greatest pressure. There is a minimum 1cm margin around most inked printings.

[4] Although the system has been developed with the downward pressure of a platen, its adaptation to roller relief presses could be possible using suitable holding devices of chases and quoins.

Historical precedence for the Modular System was found in descriptions of the earliest movable type from tenth and thirteenth-century China, which have methodological similarities to a system of interrelating, multiple-purpose, *graphic* relief printing surfaces. Both the earliest movable type inventions and the Modular System were devised to overcome the time-consuming problems of cutting single-purpose relief printing blocks. The use of a press and furniture that was primarily developed with the use of movable type has an obvious precedent in *letterpress*; but the greater similarity, in the description of the earliest known movable type of P Shêng (c1041–48,) and Wang Chên (1290–1333) translated by Carter (1882–1955), lies in the simplicity of the Chinese hand-printing relief process and Chinese brush calligraphy.[5]

Unlike alphabetical structures, Chinese characters face organisational dilemmas conversant with the naming, retrieving, categorisation and notation of a pictorial system. Such a system identifies with the general practical pitfalls and dilemmas encountered by its inventor Pi Shêng, but also with his specific use of materials, his preoccupation with efficiency and time, and his means of securing and fixing component parts. Pi Shêng similarly utilized, by adaptation, an existing relief printing process. His contemporary chronicler Shên Kua, (1031–95) particularly mentioned the efficiency of cleaning, composing and dishing the square fired clay type, and that printing was fast. Pi Shêng devised means of holding and placing which were easily reversed, and extra components were quickly supplied. His cogent reasons for not using wooden blocks resonate with the modular system. Similarly, only Pi Shêng appears to have used the type, and perhaps as a warning against devising too personal a system, the type is lost. The 1313 details of the wood type of Wang Chên (circa 1290–1333) describe components for fixing and placing that are similar to later European letterpress inventions, of chases, formes and quoins,

[5] Subsequent texts (Needham 1985) appear to use this translation.Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co.

and have relevance to the fixing and placing strategies devised for the Modular System enlarged in Chapter 4 Printing: *Kentōban*, Chases and Furniture.[6]

Investigations into the historical precedence for processes and imagery developed with the Modular System identified an affinity with historical functional colour relief printing, which in turn contributed to the development of the system. The search for the ancestry of the physical components of the system has uncovered similar technology, which has often been employed for practical purposes, and which has also generated innovative graphic imagery. Thus relevant methodology and graphic outcomes have been found in areas where practical purposes have directed printing innovation. From unexpected – even secretive – corners, away from the mainstream of image history in print and obliquely from the straightforward history of printing, have been found the key areas for the research; and these have in turn advanced the knowledge which has helped to develop the Modular System. Innovative graphic solutions for functional purposes represent the key for the examination of printed historical evidence for the project.

Historical precedents for components of the Modular System are expanded in Chapter 3 The Printing Surfaces: Acetal Resin, Linoleum and Vinyl and also in Chapter 4 Printing: Kentōban, Chases and Furniture. The historical precedents for processes which were developed with the Modular System are examined in conjunction with its five developmental stages. These consist of I: Experiment, II: Development and III: Emergence of the Modular System in Chapter 5, with IV: Continuation and V: Growth in Chapter 6.

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[6] Wang Chên claimed his type was developed in 1298. The Agriculture book was printed from blocks in normal manner in 1313 because the work on conventional woodblocks had started when the writing of the book was finished. The actual printing process remained unchanged: in a footnote p.221 Carter adds 'once the type is set, the process seems not to differ materially from that of block printing.'Ibid.p.217

Historical precedents for processes go back to the origins of printing, where the simplicity of the relief process is evident and still relevant. They continue into an area where the simple process encountered difficulties with the use of colour. In addition to instigating innovations in relief printing, the perceived difficulty of colour and multiple block printing often demanded a reason for proceeding, or a purpose, for printing in colour. As they represent an influence on the graphic outcome, the impetus for embarking on such printing, and the function of the printing, were as relevant to the historical investigation as the technical processes.

The earliest Chinese colour-printed book, *The Studio of the Ten Bamboos Album of Woodcuts* (c 1619), had a functional role as a painting manual.[7] The three earliest Japanese books with printed colour were all 'remarkable' for being 'mathematical or scientific.' In the kimono pattern book *O-Hiinagata* (1677), different colour schemes of the same kimono designs was effected by inking the same block with a different colour. This informed the *Addon* print series which used the same simple expedient (**Fig 6:3** p.148).[8] At the inaugural stages of printing with movable type in Europe, Ratdolt (1442–1528) emphasised the most significant aspect of a moon eclipse when he printed 'the first … coloured astronomical diagrams,' in his 1485 edition of the *Sphæicum Opusculum* in black, yellow and red (**Fig 2:3** p.32). The phenomenon turns the moon red: the inclusion of colour distinguishes simple discs as the sun or moon.[9]

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[7] Vedlich, J. and Z. Hu (1984). The Prints of the Ten Bamboo Studio. Ware, Hertfordshire, Omega Books. p. 9-10

[8] **1:**'The first definitely attested book with colour printing is a work on mathematics , the *Jinkō-ki*, compiled by Yoshida Mitsuyoshi. ' First published in black and white in 1627 in 4 vols. and further B&W editions in 1634 &1641 . The 3vol. *Shingpen Jinkō-Ji* of 1641 'with colour printed illustration.'
2: *Senmyōu*-reki 1644 from p.124 '2 pages in Vol.4 are printed in black, red and blue.'
[See also Chapter 4 registration.]
3: *Kakuchi sansho* 1657 'with colour printing'
4: 1677 *O-Hiinagata* 'printed in red, blue, olive-green and black though with only one colour per sheet.'
Waterhouse, D. B. and A. British Museum. Dept. of Oriental (1964). Harunobu and His Age; the Development of Colour Printing in Japan. London, Trustees of the British Museum. p. 18

[9]' Redgrave, G. R. (1894). Erhard Ratdolt and His Work at Venice, a Paper Read before the Bibliographical Society November 20, 1893. London, Printed for the Bibliographical society. p. 19 -20, plate VII

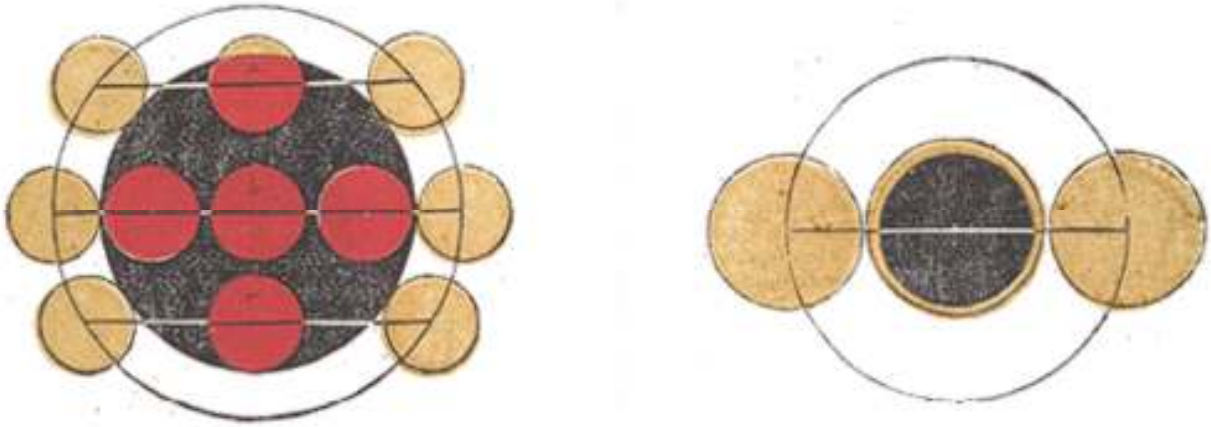

Fig 2:3 *Theorica eclipsis lunaris* on the verso folio 35 of *Sphæicum Opusculum* Sacrobosco 1485 printed by Earhard Ratdolt

Throughout the research, innovative processes identified as precedents for similar strategies employed in the system further influenced their development. In the case of the inventors and developers of compound printing devices, their graphic outcome also had significant influence on the research. In finding inspiration from the original compound initial letters of Fust and Schoeffer (1475), the research joined a tradition of emulating, and speculating on, the bi-coloured simultaneously printed letters which are examined in Chapter 3 with the compound matrices: their descendants in the Modular System.

The prints generated from the developing modular system specifically revealed similarities with historical security printing and research exposed methodological similarities.[10] The additional complication of printing arising from the use of colour was recognised early in printing history and its inclusion actively exploited the difficulty of colour printing. Chinese paper money is an early example of innovation for the specific purpose of obscuration in order to mystify the printing process and render imitation difficult.[11] Such strategy often involved colour use and complicated lineal design. All Chinese paper money plates were metal and relief printed, but no printed paper notes

[10] The similar use of make-ready with a platen press by the Bank of England 1853–1937 is addressed in Chapter 5.
[11] See Chapter 4 Printing.

survive from before the Mongol Yuan dynasty (1271-1368).[12] A recent rubbing from a metal relief printing plate of a Jin dynasty (AD 1115–1234) 10 *Guan Jiao Chao* is evidence of the durability of the Chinese stone-rubbing process, but also of the use of complicated lineal design for security purposes (**Fig 2:4a** p.34).[13]

The intaglio machine engraving was submitted by Richard Williamson in 1819 to the Royal Commission set up in 1818 'for enquiring into the mode of preventing the Forgery of Bank Notes' on behalf of the Bank of England (**Fig 2:4b** p.34). It was machine-engraved: a recent invention that featured in many of the submissions.[14] The similarity to lineal patterns still found on security documents in a post-chequebook era is shown with detail from a recent British passport flyleaf (**Fig 2:4c**). However the passport was actually printed (security printing necessitates secrecy), it demonstrates that the use of lineal tonality still denotes 'security'.[15]

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[12] The earliest extant specimens are from tomb excavations. Glahn, R. V. (2005). The Origins of Paper Money in China. The Origins of Value:the Financial Innovations that Created Modern Capital Markets W. N. Goetzmann and K. G. Rouwenhorst. Oxford; New York, Oxford University Press**:** 65 - 91.p.84.

[13] A rubbing from a printing plate would be reversed: the reproduction is right-reading. I am grateful to David Barker for reading the Chinese text and for explaining that the rubbing has been taken on translucent paper and turned over to reverse the exact copy of the printing plate: back to right-reading. The Inner Mongolian Numismatic Research Institute. China Numismatics, E., Department (1987). A Compilation of Pictures of Chinese Ancient Paper Money. Beijing, The China Finance Publishing House. p.22.

[14] No biographical details have been found for Williamson. Royal Society of Arts (1819). Report of the Committee of the Society of Arts, &c., Together with the Approved Communications and Evidence Upon the Same, Relative to the Mode of Preventing the Forgery of Bank Notes. London, Royal Society of Arts. pp. 58–59.

The forgery that had particularly dogged the issue of paper money by the Bank of England from the late eighteenth century was countered by measures which increasingly aroused public indignation. Forged notes were not exchangeable at the Bank and the punishment for possession was hanging. Forgers were rarely caught; the victims generally 'poor and ignorant folk' Mackenzie, A. D. (1953). The Bank of England Note, a History of its Printing. Cambridge UK, University Press. p.58

[15] Elizabeth Harris makes a similar point in her paper on William Congreve's compound plates 'that sometimes the typical compound design, rather than the peculiar details of printing, was taken as a sign of authenticity' appending illustrations of examples: needle-cases Fig 10 and ink labels Fig 15 Harris, E. M. (1967). Sir William Congreve and His Compound Plate Printing p.87.

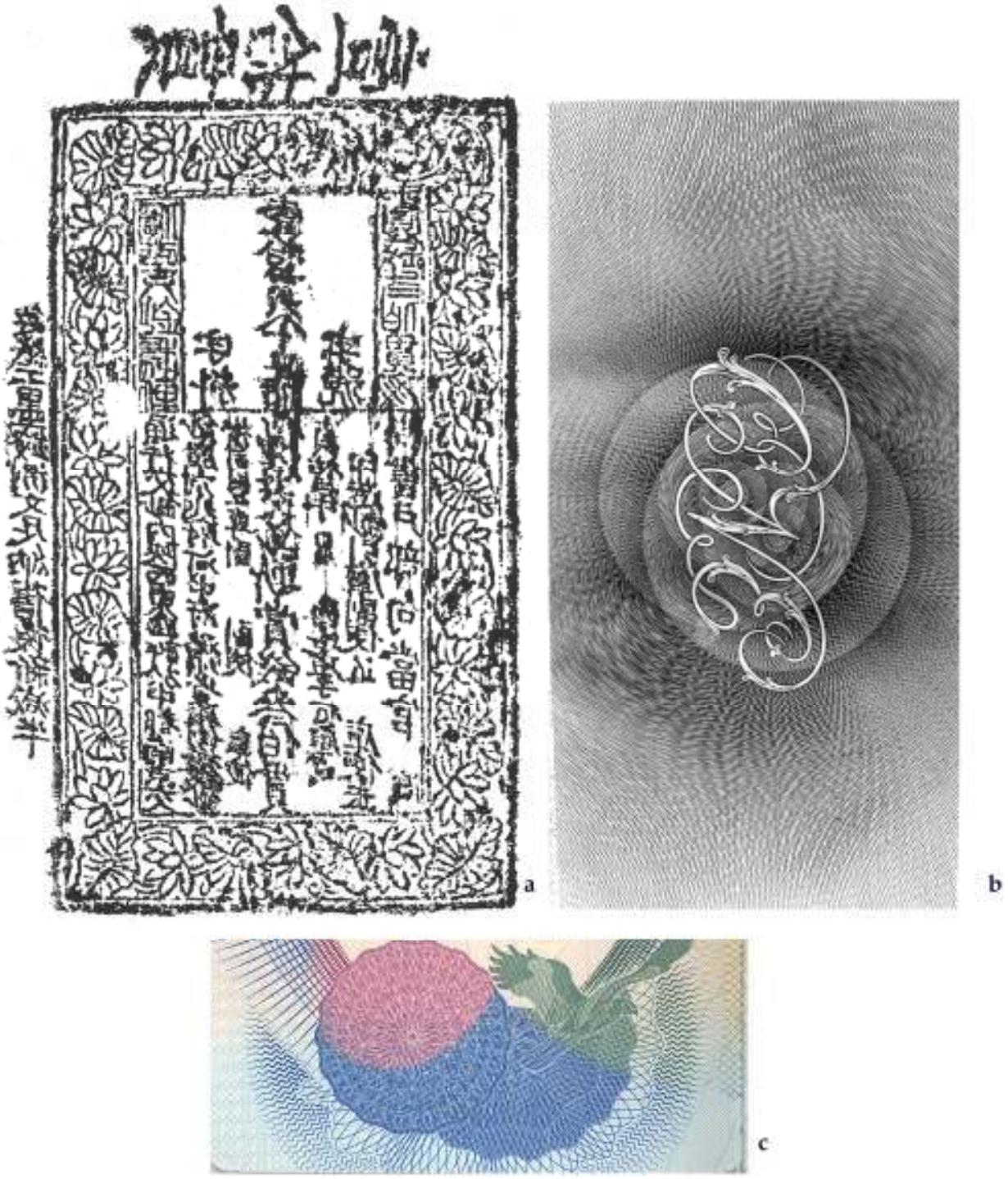

Fig 2:4 Endurance of lineal complication for security:
a) A Jin dynasty (AD 1115–1234) 10 Guan Jiao Chao rubbing from a printing plate.
b) A machine engraved plate 1819 submitted by Richard Williamson, to 1818–19 Bank of England Royal commission Enquiry: monogrammed for the Monmouth Bank.
c) Detail of the flyleaf of a 2007 British passport.

The descendents of the rose-engine used for the plate were still 'in world wide use for security printing' in 1953 (**Fig 2:4b** p.34).[16] Williamson's machine engravings raised conjecture in the research, influenced the use of the Modular System and introduced, through their connection to John Holt Ibbetson (1771–1844), one of the primary inspirations for both the graphic output and for components developed for the Modular System (**Fig 2:4b** and **Fig 2:5**). Along with Ibbetson's work, they influenced the construction and use of the circular chases examined in Chapter 4, and the devising of circular blocks with elliptical linear tone described in Chapter 3.

Ibbetson sent his proposal for the Bank of England to the Royal Commission in 1818. He is usually considered in this context for his indignation over the entry of the Royal Society Committee's Commissioner, Sir William Congreve (1772–1828) who, he claimed in a pamphlet which illustrated his proposals, had access to his ideas and whose submission resembled his own.[17] Ibbetson's proposal, the submission he questioned by William Congreve, and the accusatory pamphlets they exchanged all contain imagery which had direct influence on the development of the Modular System. Both Ibbetson and Congreve generated innovative printing solutions from encountering difficulties with depiction.

In addition to accusing Congreve of appropriating his idea, Ibbetson's pamphlet *A Practical View of an Invention for the Better Protecting Bank-Notes against Forgery* (1820) was an attempt to interest country banks in his proposal after its rejection by the Committee.

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[16] Between 1805–10 Cyrus Durand 'produced a machine whereby lines, both straight and waved, might be rules upon a printing plate, and Asa Spencer conceived and developed the idea of printing plates by means of the rose engine.' Mackenzie notes that the rose engine has 'in these days (1953) been superseded by the geometrical lathe and Perkins plate transfer (mentioned in regard to printing a printing plate p. 26) and Durand's ruling machine by modern improvements' but that the inventions preceded those 'now in world wide use for security printing.' Mackenzie, A. D. (1953). The Bank of England Note, a History of its Printing. Cambridge UK, University Press. p.34.

[17] Detailed information on the Congreve/Ibbetson exchange by Elizabeth Harris. Harris, E. M. (1967). Sir William Congreve and His Compound Plate Printing Also printed with minor adjustments in Journal of the Printing Historical Society No 4 1968 pp. 56–67.

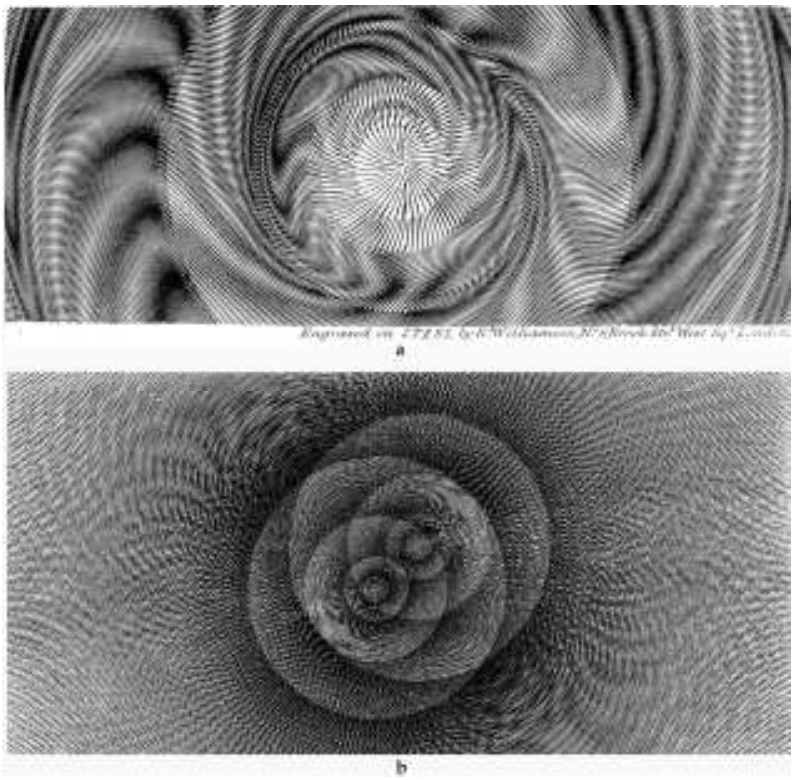

Fig 2:5 Richard Williamson's machine engravings: **a** Steel plate submitted to the Committee 1819: page 58 of the Royal Society Report 1819, **b** on copper: reproduced by Ibbetson in his *Practical View* pamphlet 1820.

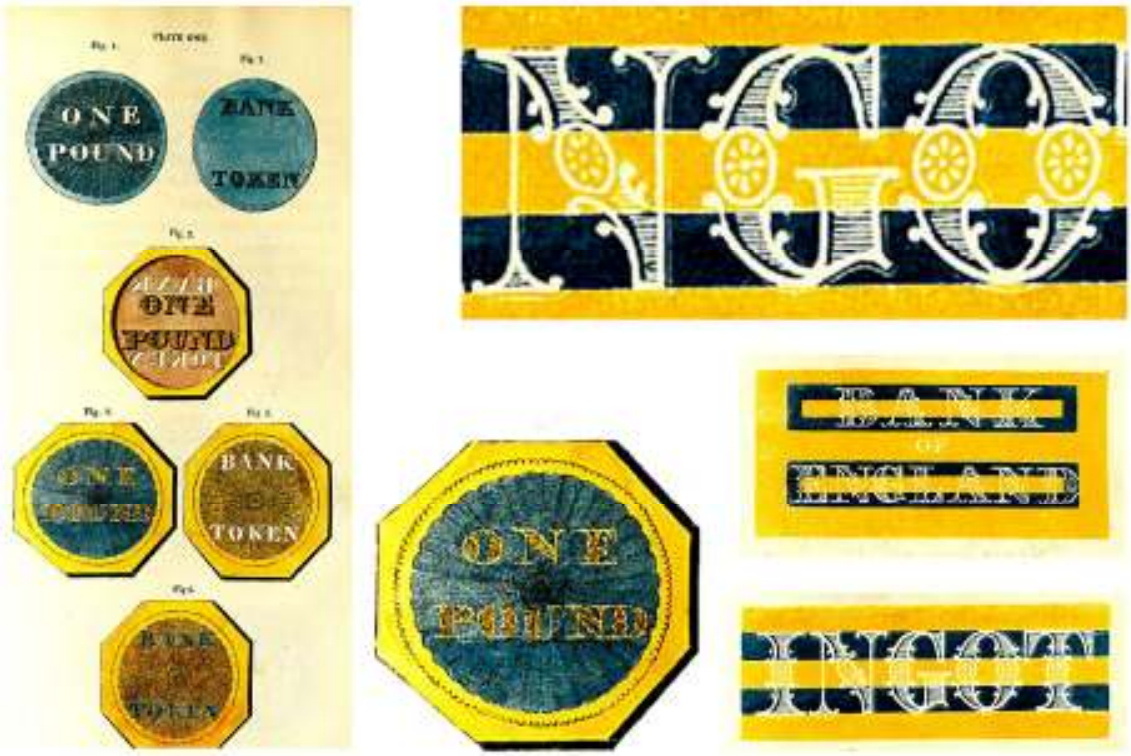

Fig 2:6 William Congreve's bi-metal coin and ingot from *Principles* 1919, depicted by compound wood engravings by Richard Branston. The central Figs are details. Courtesy of the British Library.

In furthering his case for using his machinery to engrave over hand work, Ibbetson reproduced Williamson's engraving without letter **Fig 2:5b** page 36 – in order to deride the application of a single-plate, complicated design, which took very little time and could be replicated, quoting Williamson's submission to the Royal Society against him.[18] Later evidence that Ibbetson owned the plate without letter, and that it was copper, raises invites conjecture over its fabrication: was the unlettered copper plate a practice run or a demonstration of their ease of replication? Did Williamson secretly engrave his submission using Ibbetson's Eccentric chuck?[19]

The chuck in question appears to have been incidentally applied to printing by its inventor. In his anonymously published first edition of *Specimens of Eccentric Circular Turning* (1817) Ibbetson had adapted his ivory and wood turning apparatus to engrave both intaglio plates and relief blocks for the book that described its use, stating in the introduction that

> …the very great expense of getting the necessary engravings executed, indeed almost the impossibility of getting them done at all, has hitherto prevented him from carrying his invention into effect. He has however, never abandoned his

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[18] '...they are not the product or works of chance ... I am ready to engrave again any pattern offered me.' Williamson appears not to have been assisted: '... having printed myself every impression that has been taken from any plate of mine; nor did any one know or see any thing of the steel plates engraved by me, excepting my own family... before submitting.' Royal Society of Arts (1819). Report of the Committee of the Society of Arts, &c., Together with the Approved Communications and Evidence Upon the Same, Relative to the Mode of Preventing the Forgery of Bank Notes. London, Royal Society of Arts, Arts, R. S. o. (1819). Report of the committee of the Society of Arts, &c., together with the approved communications and evidence upon the same, relative to the mode of preventing the forgery of bank notes. London, Printed by order of the Society. pp. 57–58.

[19] Williamson's plate later reappeared, by permission of Ibbetson, on page 80 of The Art of Drawing on Stone 1833 by Hullmandel (1789–1850), to illustrate transference of an engraving to stone.
'this impression was thrown off on stone by permission of Mr Ibbetson, from an engraving executed by machinery on copper plates' and invites comparison by citing *a Practical View* adding that 'I must beg leave to observe here, that the specimens given are from copper plates, from which many impressions have already been taken, which are, consequently, partly worn out.' The wear may indicate Ibbetson's use.
The evidence that the *difficulty* of printing processes were actively sought by the Bank is supplied by Mackenzie who states that Ackerman had submitted the same strategy to the Committee, ('prophetically' as it was later adopted) but the Bank rejected all lithography as too simple. Mackenzie, A. D. (1953). The Bank of England Note, a History of its Printing. Cambridge UK, University Press. pp.58–60.

> object; and pursuing it, has, at length, constructed a piece of Machinery which enables him to engrave the copper-plates himself.[20]

In the third edition, published under his own name, Ibbetson states that he had constructed a chuck ' in aid of a plan [he] had conceived for rendering Bank Notes more difficult of imitation.'[21] Ibbetson submitted both engravings on copper and what appear to be wood engravings, which would render Ibbetson's work with machines an early application for relief engraving (**Fig 2:7** p.39).[22] Ibbetson refers to the copper plates in his text but seems to consciously avoid describing his relief engravings: 'My dissected Blocks may be made of any metal; but I construct them of a material which, I consider, offers superior advantages.'[23] In *Sir William Congreve and his Compound Plate Printing* (1967), Elizabeth Harris observes that Ibbetson was also secretive about the way he joined the blocks. They appear to have been engraved *after* segmenting, in the later tradition of bolted blocks, leading to the question of whether Ibbetson pre-empted the process.[24] Harris observes the simplicity of the blocks and that they do not compare with the intricacy of William Congreve's compound plates (**Fig 2:8**p.41). However Congreve initially proposed a bi-metal coin and in the gestation, timing and his method of depiction in print, Ibbetson may have had cause to cry plagiary. What concerns the present research is that Congreve's original compound printing surfaces were simple engravings on wood and that, like Ibbetson's machined plates, they were a printing invention which rose out of the dilemma of depicting a different invention in print.

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[20] Ibbetson, J. H. (1817). Specimens in Eccentric Circular Turning. London. p. ii.

[21] Ibbetson, J. H. (1838). Specimens in Eccentric Circular Turning, with Practical Instructions for Producing Corresponding Pieces in the Art. London : Longman, [1835]. p.10.

[22] All editions carry small wood engraved samples of the steps to accomplish the intaglio Specimens, but later editions (1838) append extra boxwood Specimens that Ibbetson alludes to engraving by machine.

[23] Ibbetson is comparing his blocks to Congreve's metal compound plates. As evidence that Branston and Congreve were aware of his work, Ibbetson relates that they visited the shop that sold his book; where Branston claimed he could copy the specimens. Ibbetson, J. H. (1820). A Practical View of an Invention for the Better Protecting Bank-Notes Against Forgery. London, published by the author. p.63.

[24] Jackson dates the use to 1842. '…when the *Illustrated London News* was started when large blocks and quick engraving came to be in demand.' . Jackson, M. (1885). The Pictorial Press : its Origin and Progress ; with One Hundred and Fifty Illustrations. London, Hurst and Blackett. pp.317–326.
Manuals mention bolted blocks from Marx (1881) who includes an advertisement for them.

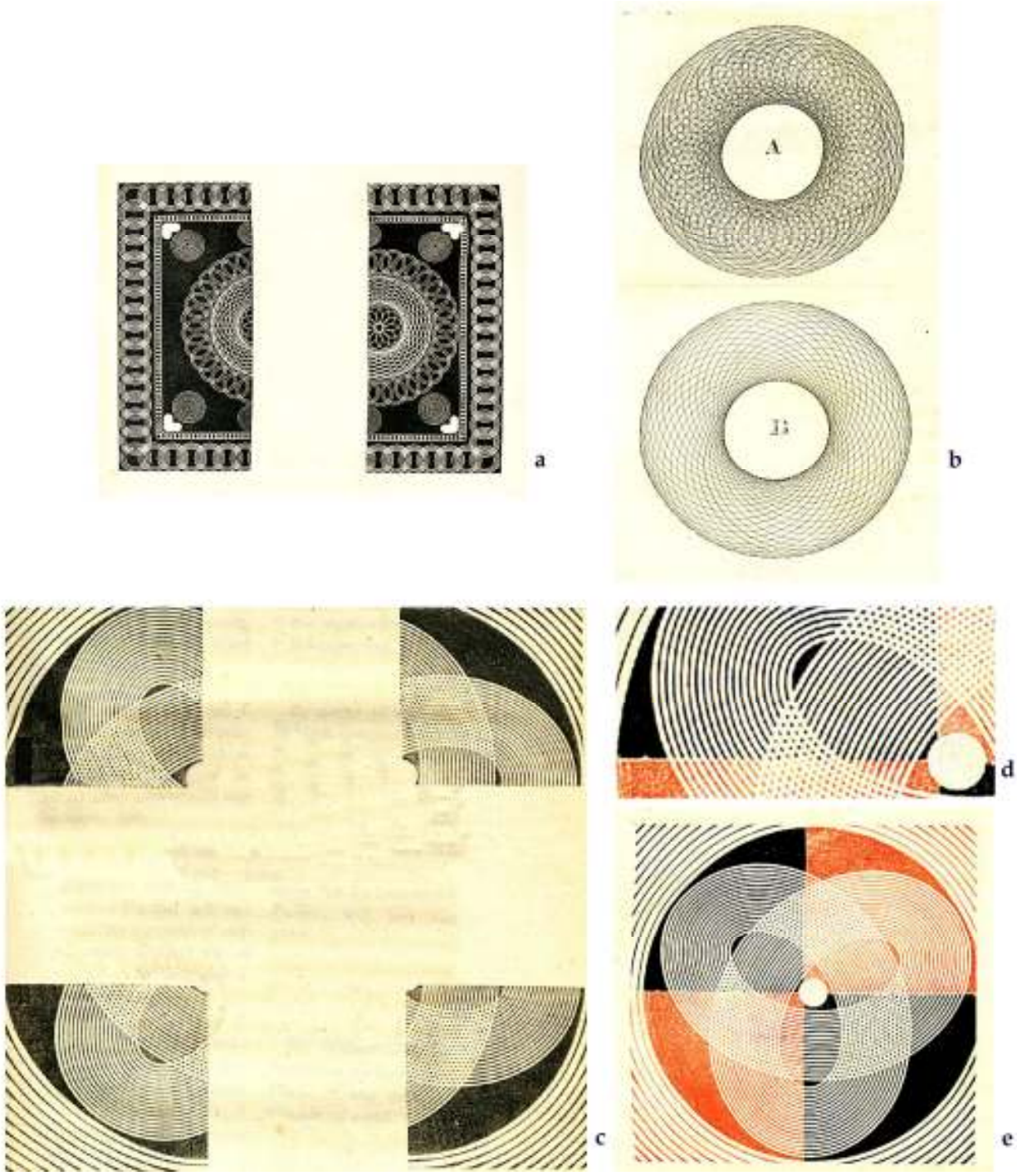

Fig 2:7 John Holt Ibbetson: Illustrations from *A Practical* View1820 showing his proposals to the Bank of England using his eccentric chuck 1919.
a) Divided machine engraving which appears to be on wood.
b) Copper plate engraving.
c) Segmented machine engraved relief blocks shown in his pamphlet divided.
d)Detail of the same blocks joined and coloured showing continuous colour.
e) The joined coloured image actual size 2 ½ " From the Patens Office copy in the British Library.

Branston's solution for depicting the interlocking coins and a bi-metal ingot was with composite woodblocks, which are the only printed colour in his pamphlet (**Fig 2:6** p.36). The coin was the first of three compound concepts proposed by Congreve, who reproduced his third submission of compound printing from metal plates in a pamphlet directed at Perkins, his rival for security printing work, rather than Ibbetson.[25] The prints in *An Analysis of the True Principles of Security against Forgery* (1820) show that the intricacy from actively sought complication, considered together with the smelting procedure for fabricating the compound plates and their specialised printing machinery, make Congreve's *concepts* more of a precedent for the Modular System than his images(**Fig 2:8** p.41).[26] This is in comparison to the simplicity of Ibbetson's perceived processes and imagery. In his introduction Congreve explains the ease of producing a black intaglio engraved line and correspondingly a relief engraved white line, continuing:

> that which is difficult in either case is easy in the other; so that when these respective styles can be interchanged and mixed by separate impressions, there is no difficulty in the production either of the white line or the black line, however complicated the figure to be produced.[27]

The details show that in addition to printing two colours simultaneously, Congreve's compound plates can easily produce both black and white line (**Fig 2:8b** p.41). In this respect his technology resembled that of Perkins and the outcome of the direct transfer

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[25] Other *Analysis* pages are hand-coloured. The second submission: a watermarked coloured paper fused to plain outer papers. Harris, E. M. (1967). Sir William Congreve and His Compound Plate Printing p.76.
[26] Harris describes the hot metal moulding of the first section of the compound plate the second. Ibid. p.74. Both the geometric lathes used to engrave the plates and the compound plate printing press were devised by Donkin (1784–1855). Greenland, M. (2009). "Whiting and Branston's Lottery Printing." Journal of the Printing Historical Society **13**(New Series): 61 - 79. pp.612.
[27] The full title of Congreve's work reveals his motive: The second edition used here, originally the property of Branston, appends extra information attacking Perkins and Dyer: the American contenders for general security printing work. [Perkins later produced the Penny black stamp with his siderography.] Congreve, W. (1820, 1820). "An analysis of the true principles of security against forgery exemplified by an enquiry into the sufficiency of the American plan for a new bank note : with imitations of four of the most difficult specimens of those notes, made by ordinary means." pp. viii–x.

Fig 2:8 William Congreve's compound plates
a) to **c**) William Congreve's compound plate printing: from *Analysis* 1829.
a part of his submission to the Royal Commission 1819,
b) details of his plate engraving showing both black and white linear work, from *Analysis* 1829
c) part of a banknote with Branston's signature from *Analysis* 1829
All the above photographed from Branston's copy of *Analysis*.
d) Compound plates for Indian revenue stamps: the last to be made 1950: printed by Michael Mitchell 1988

printing between printing surfaces used with the Modular System.[28] Congreve's established and patented compound printing plates were engraved by Donkin's geometric lathe, to which Branston usually added a characteristic foliate pattern by hand, and were the 'the first method of printing in colour by mechanical means.'[29] Re-engraving a machined block or plate has a parallel with the Modular System in dealing with laser engraved acetal resin.

The separated and joined compound plate prints by Michael Mitchell for a Double Crown menu in February 1988 are for an Indian revenue stamp that remained in use until the mid-twentieth century (**Fig 2:8c**). The dies were the last to be made by the Donkin Company in 1950, which attests to the longevity of the use of linear complication and colour for security.[30] The separations show the precedence for compound printing for the Compound Matrices in the Modular System – after which they were named. Congreve also patented an embossing machine, and the way Branston and Whiting combined it with overprinting linear colour has more relevance to the graphic imagery produced with the Modular System. For the coronation of George IV in 1820, the Abbey Pass was the first commercial compound printing by Branston and Whiting and features embossed border with a complicated foliate compound design. The procession pass ticket, printed by Branston in two colours on separate blocks, shows different embossed and inked areas with a tertiary colour generated by overprinting – a similar treatment to the *Addon* series of prints (**Fig 6:3** p.148)**.**[31] The relevance to the Modular System of Congreve's invention is in the subsequent modular use by Branson and Whiting outlined in Chapter 3: The Printing Surfaces.

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[28] More than two colours were more difficult Greenland, M. (2009). "Whiting and Branston's Lottery Printing." Journal of the Printing Historical Society **13**(New Series): 61–79. p. 81.

[29] Greenland, M. (1997). "Compound Plate Printing: Security With Style." Printing Historical Society Bulletin **43**: 6-10. pp.8,10.

[30] The use of the style of compound and lineal printing without recourse to the employment of the process is discussed by Greenland on p.10. Ibid.

[31] Coronation Abbey pass ticket illustrated on p.78. Congreve patented compound printing in 1822: Branston and Whiting took over the patent from Congreve around 1824 around the time of Congreve's embossing patent. Harris, E. M. (1967). Sir William Congreve and His Compound Plate Printing p .85.

The application of Williamson's work to the Modular System lies in the use of circular linear tone and interference figures – but also in the replication that was part of his secret scheme. It is exemplified in four prints from the variable edition *Tabby Twenty Nines* together with the diagrammatical printing schedules used (**Fig 2:9** p.44). The production of the series is explained in Chapter 6: Continuation and Growth of the Modular System. The influence of Ibbetson's composite blocks and elliptical linear tone continued throughout the project, informing the imagery in *Tabby Twenty-Nines* and experiments with curved linear tone and circular forms further delineated in Chapter 3: The Printing Surfaces.

Colour use continued to protract and complicate the relief printing process and added relative difficulties with pigments compared to the success of carbon, or lamp black, for printing ink. The strategy of devising processes to curtail the complications which arose from the use of colour lasted throughout the use of the relief press in the printing industry, and on to its use by artists and craftsmen. The historical research investigated how difficulties with colour use in relief printing were overcome, exploited, or even avoided by innovation. Some examples are Georges Lallermand (c1575–1636), who designed a complicated system of rollers, while J. B. Jackson (c.1701–1777) devised – and Papillon (1698–1776) adapted – roller presses, all for colour relief printing.[32]

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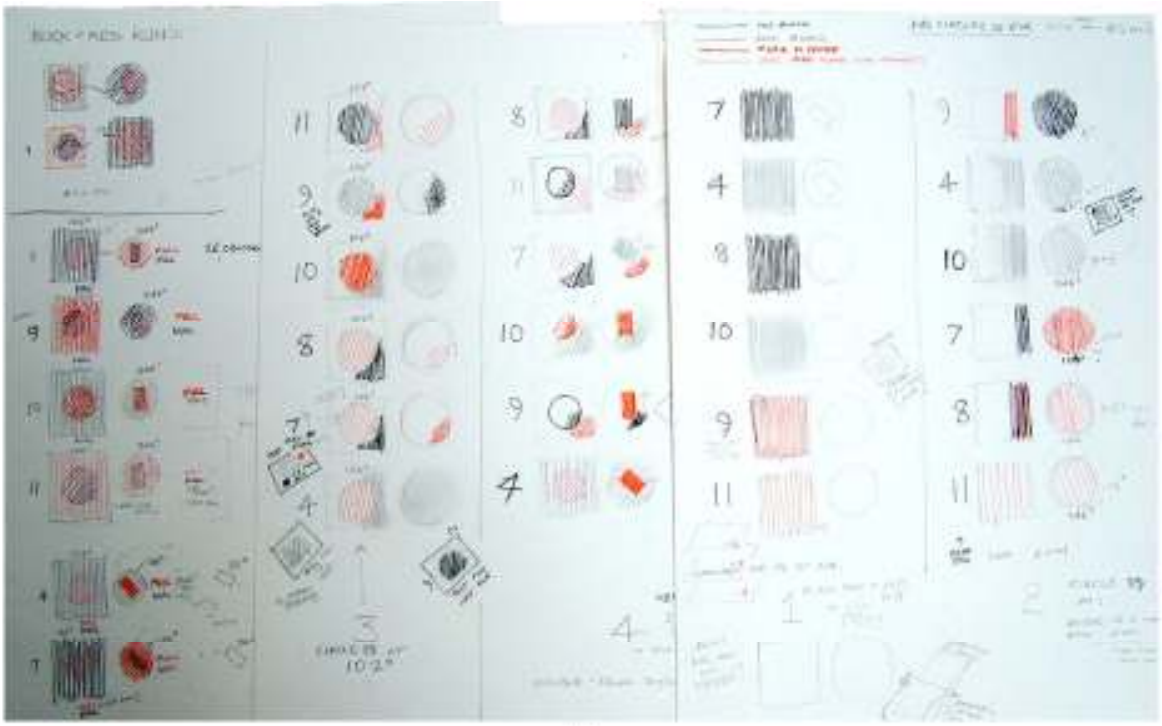
[32] Papillon's special chase for registering multiple blocks on a roller press adapted for relief printing was reproduced by Savage. Savage, W. (1822). Practical Hints on Decorative Printing. London. pp. 92–3.
'George Lallemand and Ludolph Businck, sometime between 1623 and 1640, had used not one but a series of six cylinders on three joined presses, with three printers simultaneously inking separate blocks with different tones.' Kainen, J. (1962). John Baptist Jackson: 18th-Century Master of the Color Woodcut. Washington, U.S. Govt. Print. Off. p. 41.
By his use of a roller press specially made to his own design, J. B. Jackson printed colour woodcuts under considerable pressure. 'The cylinder press of Jackson's design was finished in 1735 and paid for by the income from prolonged sieges of work for printing offices. Ibid pp. 28–29.
When an old man, Jackson made a drawing of the press for Bewick. Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. p.197.



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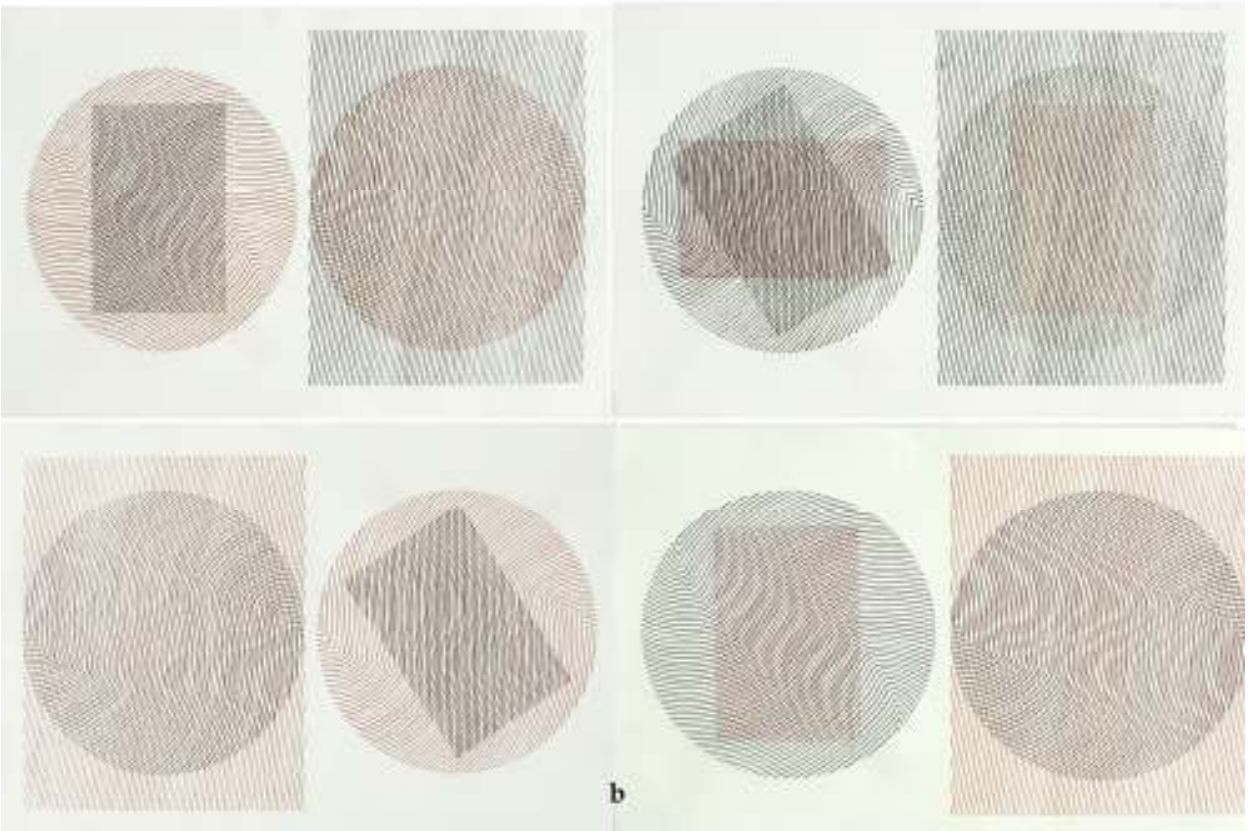

b

Fig 2:9 *Tabby Twenty Nines* 2010 **a**) Diagrams and printing schedules **b**) four prints from the variable series

Papillon also devised a registration box that worked on a similar principle to the *kentōban*: (**Fig 4:3b** p.101). He paid careful attention to the management of damp paper for multiple pass colour printing, while Fust and Schoeffer in 1457 avoided the same situation by their simultaneously printing compound initial letter plates.[33] They also limited their ink colours to a usable red and blue: the blue not as successfully amalgamated with the essentially boiled printing oil.[34] Oil and its use for printing was problematical with black ink, but caused extra problems with colour, as can be seen in Jackson's work setting off on the opposite pages.[35] Ink research and the successful sourcing of pigments for translucent printing inks were the basis of success for both Le Blon (1667–1741) and for William Savage (1717–1843).[36] Conversely, the strategies devised to render 'colour' in black ink tone, which stretch from hand engraved hatching for heraldic tints to ruling machinery, also establish precedents in the use of engraved linear tone.

In their ways of preparing a relief printing surface, the work of Williamson, Ibbetson and Congreve has further relevance to the Modular System where preparatory graphics can be generated by previous proofs, a printing surface transferred on to another, *kentōban*

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[33] Papillon advised having no more than twenty prints in progress at the same time, for fear of variations in the registration from uneven paper drying. Translated by Savage. Savage, W. (1822). Practical Hints on Decorative Printing. London. pp. 91–2.

[34] '*Fire-boiling*' was followed by straining and standing: Moxon suggested the efficacy of the varnish depended on the standing time, which prevented leaching after printing. Bloy, C. H. (1967). A History of Printing Ink, Balls and Rollers, 1440-1850. Barnet (Herts.), Wynkyn de Worde Society.p.12.

[35] Indifferent oil contributed to Jackson's lack of reputation and success: the copy in National Library of Wales is evidence of what Savage noted: that *set-off* marred the pages opposite his multi-block colour woodcuts in 1822. Savage, W. (1822). Practical Hints on Decorative Printing. London. p.15.

[36] Le Blon stated in an unpublished prospectus of 1720 that he needed 'suitable coloured materials' for printed colour, and that they differed from oil paint. His experiments started a decade earlier, and must have identified that, in order to spread and to overprint, printing ink for multiple plates is required to be both transparent and ductile. Lilien, O. M. (1985). Jacob Christoph Le Blon, 1667-1741: Inventor of Three and Four Colour Printing. Stuttgart, A. Hiersemann. pp. 99, 115.
William Savage, in his manual devoted to printing ink, commented that prior to the publication of his *Practical Hints on Decorative Printing* 1822, two eminent and skilled printers 'were completely baffled, and could not print some subjects in a brown Ink, to meet the authors wishes, to their great disappointment, and the printers mortification.' Savage, W. (1832). On the Preparation of Printing Ink; Both black and Coloured. London, Printed by the author, and sold by Longman, Rees, Orme,Brown, Green, and Longman. p.140.

quads and spacers, or burnt by a laser beam. The use of tint blocks in the Modular System has ancestry in relief surfaces prepared wholly or in part by ruling machines. They also have a future in the utilisation of laser cutters, thus again enabling machines to inaugurate a print. Preliminary drawing may be generated by placement, transfer or offset of an existing printing surface, or by the orientation of the engraved lines of a linear tone block. Thus drawing and designing is no longer preparatory: the preliminary work may be a print or the devising of a digital file followed by a short but noisy observation session in the laser cutting room.

Preliminary work that may have been devised on a loom, and the working drawings for engravings woven, were a further graphic influence on the development of the Modular System. Roberts Beaumont (1862–1924) wrote in the foreword to his *Colour in Woven Design* (1890) that

> Many of the patterns printed on the plates have been woven at the Yorkshire college under my supervision, and are now published for the first time: while other figures ... have been specially prepared for this book. It need scarcely be observed that the coloured illustrations are unique, being exact representations of the woven textures.[37]

The illustrations were engraved on wood by Benjamin Fawcett's firm, whose engravers, presumably working with fabric samples beside their sandbags, could consult the exact object being depicted to delineate a tint, choose a tool, and proof the colour (**Fig 2:10** p.47).

The preliminary work was lithographic colour printing for 'the first English application of colour printing to a book actually about color.'[38] Spanton's *Laws of Contrast of Colour* (1857) with a wood engraved colour plate by Edmund Evans, was an early English

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[37] Only the first edition has wood engraved illustration. Beaumont, R. (1890). Colour in Woven Design. London, Whittaker & Co. p.viii-ix

[38] Friedman, J. M. (1978). Color Printing in England, 1486-1870: an Exhibition, Yale Center for British Art, New Haven, 20 April to 25 June, 1978. [New Haven], Yale Center for British Art p.38

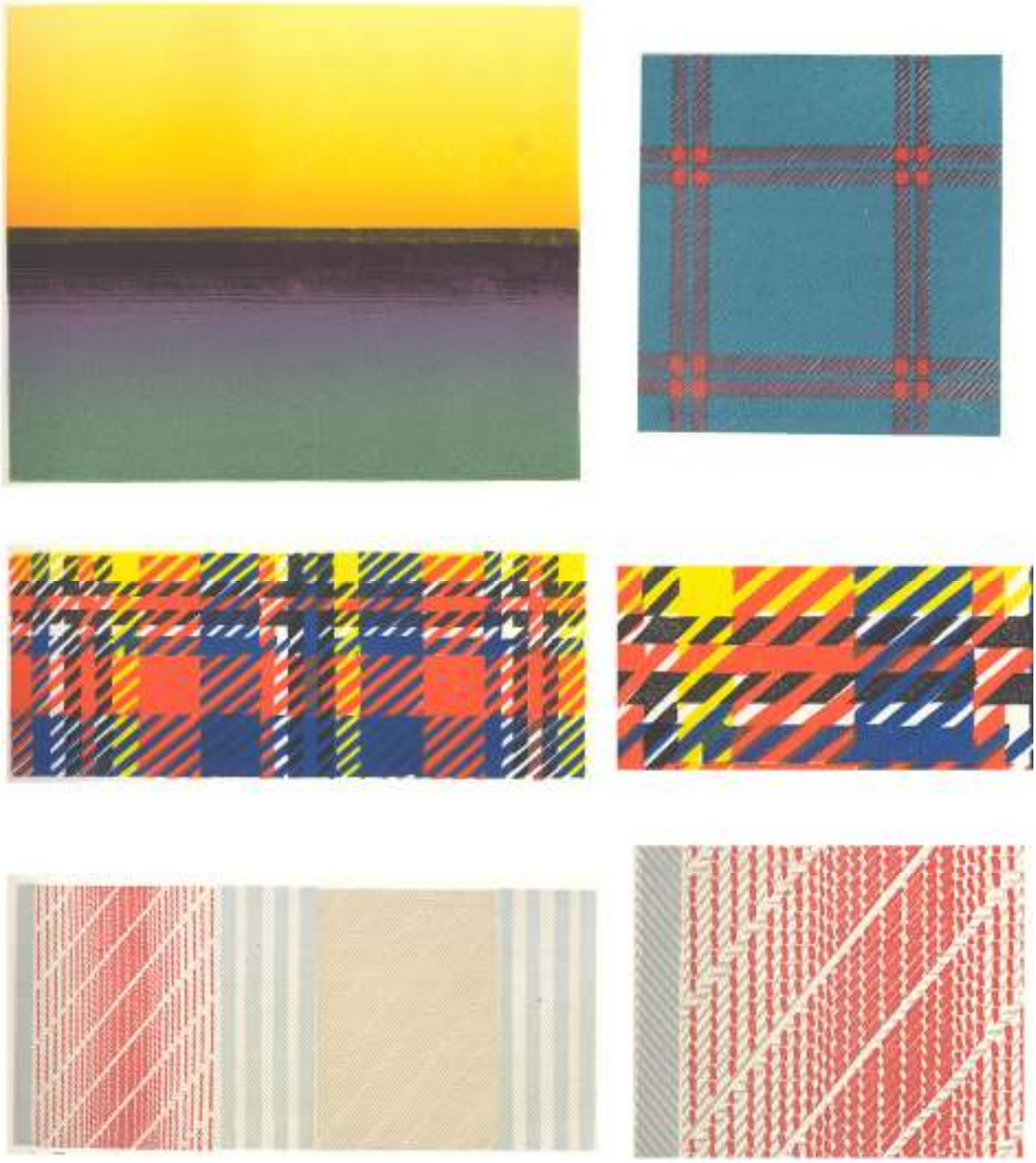

Fig 2:10 Benjamin Fawcett's wood engravings from actual fabric samples in *Colour in Woven Design* 1890 Roberts Beaumont. Showing actual size and two details.

translation of Chevreul (1839) *The Principles of Harmony and Contrast of Colours and their Application to the Arts* (**Fig 2:11a** p.49). For his original French publication, Chevreul appended an atlas of diagrams printed by the new lithographic process – which he personally resorted to heavily retouching.[39] Spanton's second edition in 1860 contained seventeen colour plates by Evans which followed Chevreul's original colour examples: (**Fig 2:11b** and **Fig 2:11c**). The colour diagrams remained an unusual subject for Evans, but demonstrate why MacLean in his forward to Evans's *Reminiscences* (1967) could state that he 'was particularly successful at mixing bright inks, as several anecdotes in his reminiscences show.'[40] In her description of the diagrams, Friedman (1978) explains why Evans was particularly suitable for the job, in spite of his declared use of overprinting:

> Most of the prints in the book illustrate the effects of neighboring colours on the appearance of a given hue. Because all the colors were shown in discrete, relatively large areas, not overlapping with any other color, these illustrations were particularly suited to Evans's method of color printing. Unlike Baxter and his followers, Evans did not superimpose colors from successive blocks: rather he designed his engravings so that the colours lay side by side.[41]

Fig 2:12 (p.51) shows his accuracy using the letterpress pin system for registration; pin marks are visible on an 1869 edition (**Fig 2:12d**).[42] The 1869 diagrams are inspirational graphic images for the Modular System, particularly the circles from plates III to V, which illustrate 'the modifications which the principal colours induce in those which

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[39] Faber-Birren explains that Chevreul's struggle to have adequate reproduction of his theories in colour delayed publication and that the first lithographic illustrations in English in Martel's 1854 translation (first published without illustrations in 1843) were better copies, which he reproduces: they differ only slightly from Evans in layout but the colour is more drab. Chevreul, M. E., Faber-Birren (1987). The Principles of Harmony and Contrast of Colors and their Application to the Arts: based on the first English edition of 1854 as translated from the first French edition of 1839. p.36.

[40] Check-list of books published with Evans's work pp.79–81 reveals exclusively illustrative work but MacLean does not list Spanton 1857. Evans, E. and R. McLean (1967). The Reminiscences of Edmund Evans. Oxford, Clarendon Press. p. x.

[41] Friedman, J. M. (1978). Color Printing in England, 1486-1870: an Exhibition, Yale Center for British Art, New Haven, 20 April to 25 June, 1978. [New Haven], Yale Center for British Art p.38.

[42] I am grateful to Graham Williams who spotted the pin-marks on his copy and took the photograph.

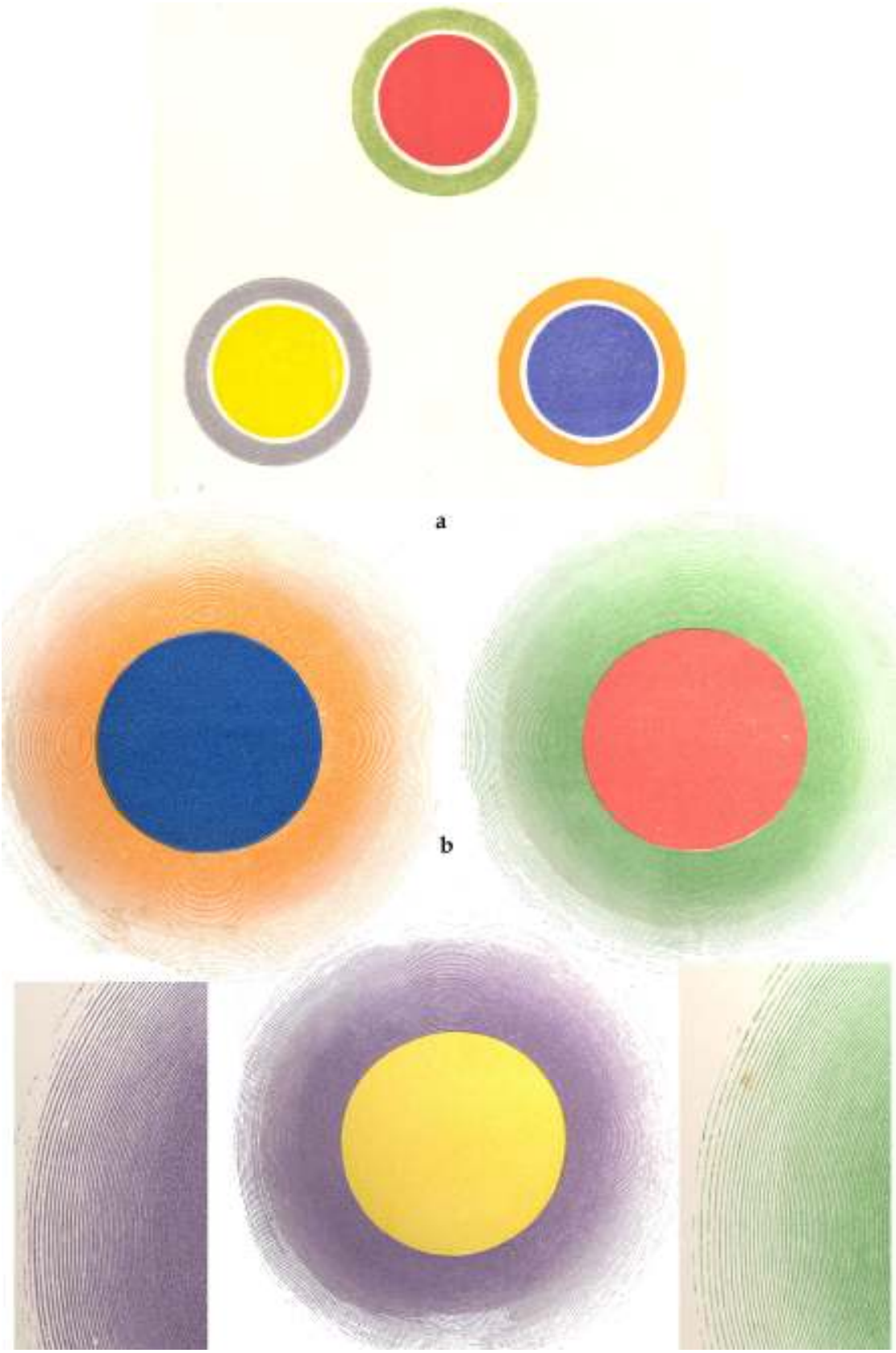

Fig 2:11 Edmund Evans: wood engravings for *The Laws of Contrast of Colour*: **a**) 1857, **b**) 1860

are contiguous to them' on separate pages (**Fig 2:11b**).[43] However, they also presented a model for the *modularity* of the Modular System. As each circle was printed on a separate page, Evans could use the same blocks, which was revealed by magnification.[44] The circle diagrams inspired various applications for circular blocks, specifically for engraving a small gradated 100mm diameter circle and *Chevreul Colours* is an ongoing series of prints exploring colour contrast.

On his own evidence and from his reputation, Evans took care with ink preparation. According to Bloy (1967), little attention had been paid to good colour printing until 1822. Ink recipes were secret, 'confining fine printing to a select few privy to its secrets, whilst others had to guess.'[45] He is referring to William Savage, elected as the first printer member to The Royal Society in 1825. His *Practical Hints on Decorative Printing* (1822) was the first printer's manual to display specimens of coloured inks on six pages each with three large colour 'tints' and with extensive directions for making non-fugitive colour printing inks for multiple woodblock printing.[46] The colours 'represented the complete artist's palette of the early nineteenth century,' including 'indigo, cochineal, carmine and lake, sepia, bistre, gallstone, gamboge and Indian yellow' (**Fig 2:13a** p.54) .[47] Taking the leached oil from J. B. Jackson's 1754 *Essay* as an example, he recommended substituting linseed for caprivi oil for binding pigments and to prevent them 'flying off.'[48]

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[43] Chevreul, M. E. S., John (1860). Principles of Harmony and Contrast of Colours, and their Applications to the Arts. London, Routledge, Warne and Routledge. p.17

[44] Wakeman, G. and G. D. R. Bridson (1975). A Guide to Nineteenth Century Colour Printers. Loughborough [Eng.], Plough Press. p. 40.

[45] Bloy, C. H. (1967). A History of Printing Ink, Balls and Rollers, 1440-1850. Barnet (Herts.), Wynkyn de Worde Society. p.30.

[46] Rummonds, R.-G. (1998). Printing on the Iron Handpress. New Castle, DE, Oak Knoll Press & The British Library, Rummonds, R.-G. (2004). Nineteenth Century Printing Practices and the Iron Handpress. London, British Library. p.487.

[47] Abstract: from unpublished paper. Davis, B. H. (2008). William Savage's Use of Natural Dyes in Early Nineteenth Century Printing Inks.

[48] Savage published *On the Preparation of Printing Inks, Both Black and Coloured* in 1832. the difficulty secrecy and expense of ink-making, was addressed in this comprehensive, scientifically researched volume, but the colour sections are largely taken from his 1822 publication. Savage, W. (1822). Practical Hints on Decorative Printing. London. p.15

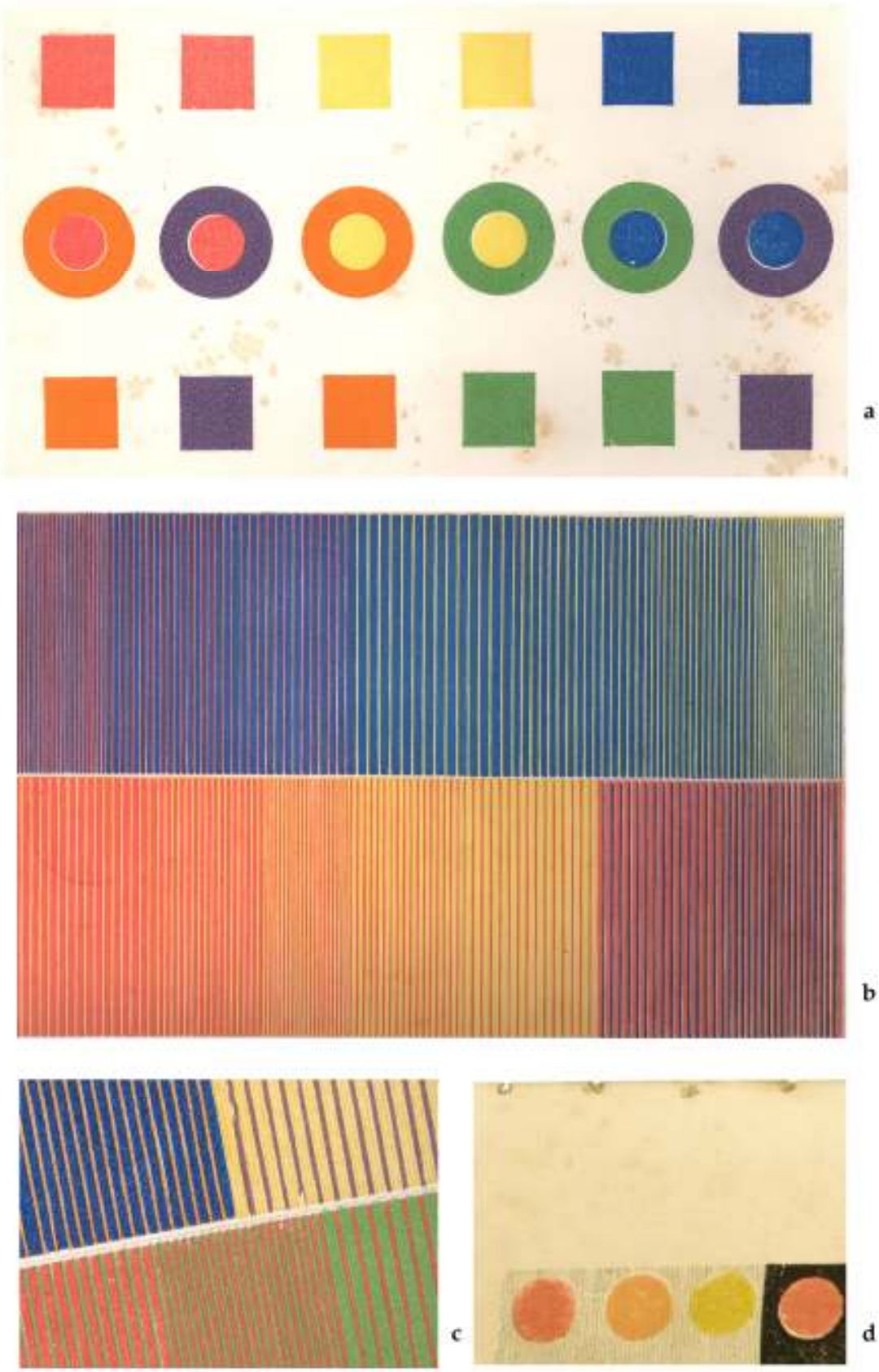

Fig 2:12 Edmund Evans wood engravings for *The Laws of Contrast of Colour*1860: **a**) Plate VI **b**) Plate XI **c**) detail from Plate, **d**) pin-mark registration.

the different effects that the same subject produces, and also to show variety of inks, Savage demonstrated the intrinsic modularity of relief printing blocks, in the ease with which the ink colour can be changed.[49] Savage's clear matte colours had influence: Hasper (1835) acknowledged his debt, and Bridson (1988) comments that 'Fawcett preferred to mix his own coloured inks and it is possible that he followed Savage's principles,' noting a similar '"dry" look and a unique softness of colour.' Fawcett's pigment density enabled the printing of multiple, thin colour layers 'after a century, none of his inks displays the slightest hint of ink migration.'[50]

By the mid nineteenth century an ink-manufacture industry had made the ingredients for colour ink-making available for a 'country printer' who, with few typefaces, could 'create unlimited variety by a judicious use of colour in job-work.' [51] The century ended with an improved situation for the relief colour printer. J. F. Earhart printed *The Color Printer* in 1892 with new ink colours, better paper and improved presses in a brief period where the compositor and printer designed their own work(**Fig 2:13b–d** p.53). Ridler (1948) states that what became know as Artistic Printing was 'the final attempt made by compositors to work out some kind of formula for jobbing design before the initiative was taken from them by outsiders.' He explains that:

> Artistic printing was made possible by two important technical innovations: the invention of the jobbing platen by George Gordon in 1851, and the introduction of

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[49] Savage published *On the Preparation of Printing Ink; Both black and Coloured* in 1832. The difficulty, secrecy and expense of ink-making, particularly with colour, was addressed in this comprehensive, scientifically researched volume, but the colour sections are largely taken from his 1822 publication. Ibid.p.15.

[50] Hasper printed a similar range of colours and included compositional information for each ink. Hasper, W. (1835). Handbuch der Buchdruckerkunst. Nach Eigener Erfahrung und Unter Zuziehung der Werke von Brun, Fournier, Hansard, Johnson, Savage, Bodoni und Taubel. Carlsruhe; Baden, D.R. Marx. p.43. Bridson adds that the prints are still commonly mistaken for chromolithography. Bridson, G. (1988). Colour Woodblock Techniques Benjamin Fawcett : Engraver and Colour Printer: with a list of his books and plates. . R. McLean. Aldershot, Scolar Press**:** 35 - 40.p.38.

[51] 'By the purchase of the most simple materials from the oil-shop, the ingenious printer has at his hand every colour that fancy can require, at the most moderate cost, without waste or delay. The appliances are few and cheap….a can of printer's varnish, to be purchased of the ink-maker.' Hansard proceeds to enumerate two pages of pigments with clear instructions for making a rainbow of inks.
Hansard, T. C. (1842). Treatises on Printing and Type-Founding from the Seventh Edition of the Encyclopaedia Britannica. Edinburgh, Adam and Charles Black. p.144.

> the point system. The jobbing platen enabled the small printer to print quickly, in accurate register, and to change easily one forme for another. The Artistic Printer took advantage of these improvements by making tint blocks, often in large numbers, the basis of his designs.

The jobbing printer additionally benefited from 'the introduction of hard packing of the platen, smoother papers, and the development of inks utilising the chemistry of the new coal-tar dyes, that enabled the printing of intricate jobs in multiple colours.'[52]

The Color Printer aimed to be a useful directory for the jobbing printer to maximise the effect of tint and tonal work. It spanned and posthumously celebrated much of the Artistic printing style. Ridler's jocular attitude to what Artistic printers actually printed with their '… supply of storks, bamboo screens, and fans which characterise the first phase of Artistic Printing' is not unjustified.[53] Hudson quotes a compositor who worked in the style, recalling with distaste the 'crowded display of the village shop window kind.'[54] Artistic Printing, including Earhart's work, was disseminated through *The Printers International Specimen Exchange*, first produced in 1880 under the editorship of Andrew Tuer. 'Actual offprints were sent in by compositors and printers both at home and abroad. Each contributor received a bound volume containing his own specimens and the collated specimens of his fellow-contributors.'[55]

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[52] 'One of the reasons for Artistic printing having been so little considered by previous writers is that essentially it was a movement among jobbing-printers, affecting the design of books scarcely at all.' Hudson, G. (2006). "Artistic Printing: A Re-evaluation." Printing Historical Society **9** (New Series): 31 -63. pp.32–3.

[53] Ridler, V. (1948). "Artistic Printing: A Search for Principles." Alphabet and Image **6**: 4 -17. p.4.

[54] Hudson, G. (2006). "Artistic Printing: A Re-evaluation." Printing Historical Society **9** (New Series): 31 -63. p.31.

[55] Ridler, V. (1948). "Artistic Printing: A Search for Principles." Alphabet and Image **6**: 4 -17. p.5

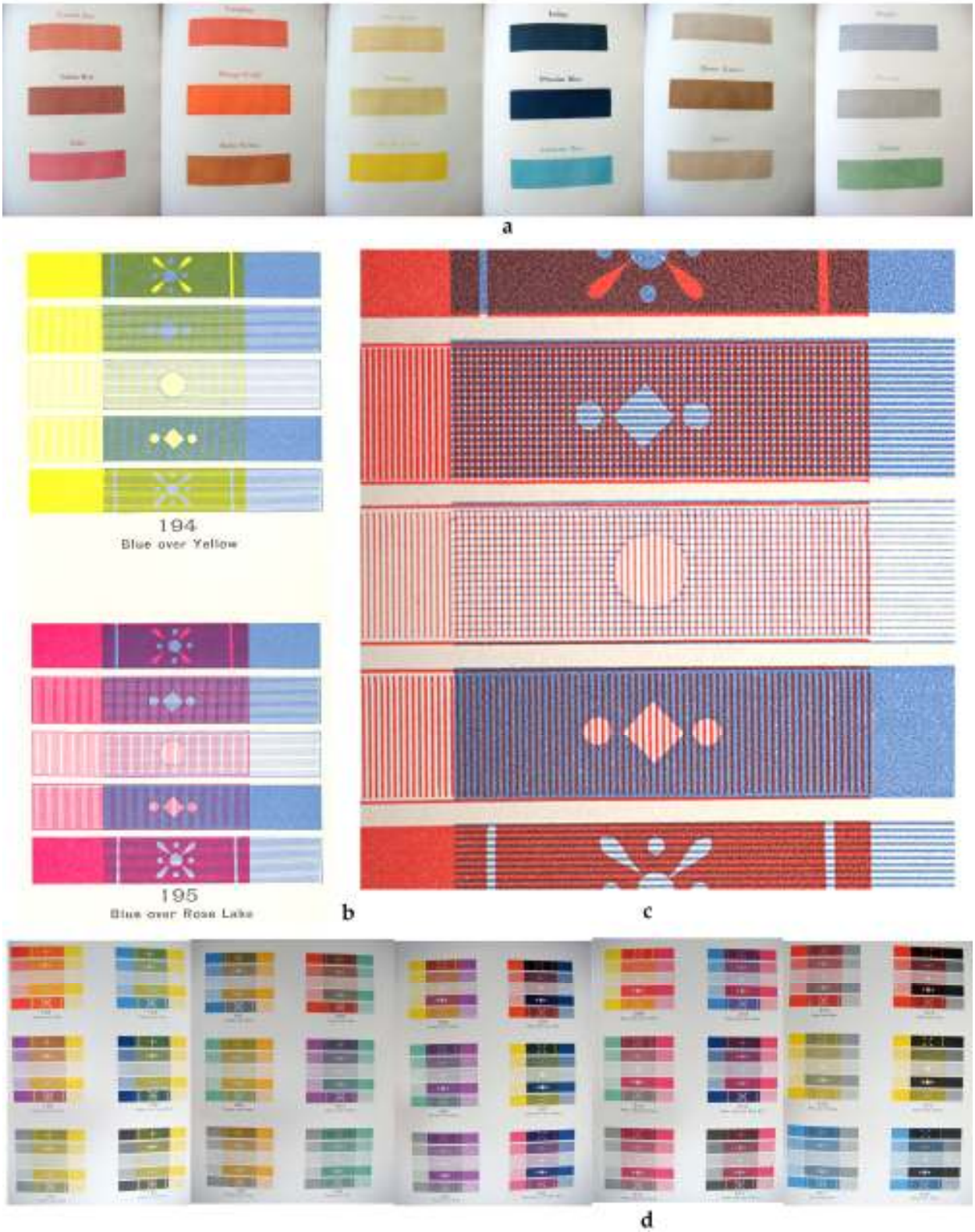

Fig 2:13 Colour and printing ink: **a**) colour sample pages from William Savage 1822 *Practical Hints on Decorative Printing*, **b**) John F. Earhart 1892 *The Color Printer*: samples, actual size, from plate 24, **c**) detail of 195 the two overprinted sample engravings, **d**) A selection of the samples numbered 179 to 220 printed on seven pages, generated by the same pair of engravings and using thirteen basic colours.

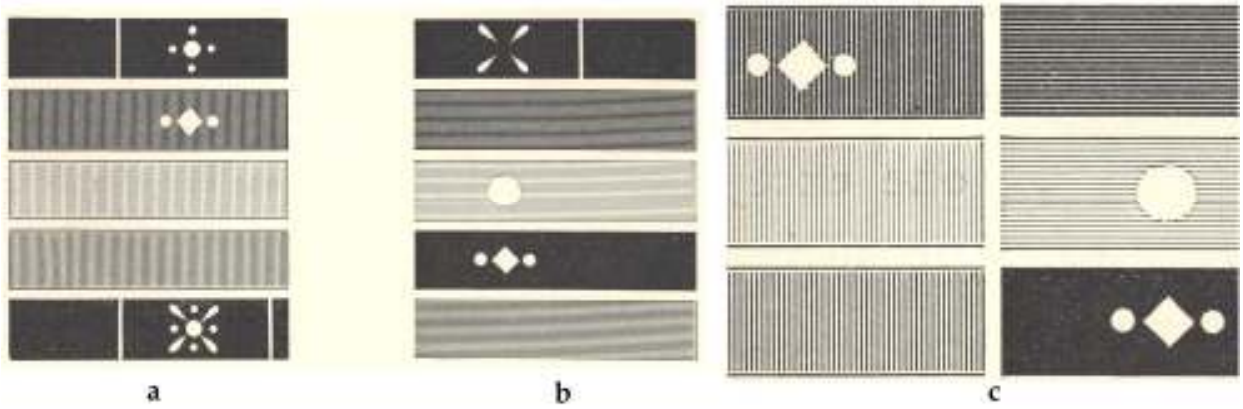

Fig 2:14 Earhart's system for colour generation of the 42 samples in Fig 2:8: **a**) first cut printed, **b**) second cut that was overprinted and staggered, **c** the detail showing wood engravings marks.

Earhart's work exemplifies a dilemma in the perusal of a process separated from its application. His influence on the development of the Modular System has little to do with the finely printed butterfly and peacock feather which usually signify Earhart's work. His sample figures numbered 179 to 220 show that he generated colour with engraved tints and a limited ink range, for the sake of the colour and for no further descriptive purpose (**Figs 2:13b-d** p.54).[56]

Earhart's tint-blocks were a pair of interchangeable, multi-use engraved printing matrices originally in wood and the samples printed were intended to be 'of special value to all printers who employ engravers or who do label work'(**Fig 2:14** p.55). Earhart used two different cuts with the second overprinted cut 'shifted half an inch to the right.' In fabrication and function they are identical to the tint blocks of the Modular System expanded in Chapter 3. The similarity extends to the conjecture over the material used for the 'cuts' and whether they have been hand engraved or machine-ruled.[57]

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[56] Earhart, J. F. (1892). The Color Printer : a Treatise on the Use of Colors in Typographic Printing. Cincinnati, Ohio, Earhart & Richardson. plates 22 to 28.

[57] Earhart's reference to 'cuts' and letterpress 'engravers' is taken as evidence that he used wood but he may have replicated the cuts by stereotyping, which he also utilised: see Chapter 3 on tint grounds Ibid. p.20. Additionally, Southward states that 'Mr J Earhart, who is an authority on the subject, considers that for colour or tint blocks boxwood is preferable to anything else.'Southward, J. (1899). Modern Printing: a Handbook of the Principles and Practice of Typography and the Auxiliary Arts. London, 4 pt. Raithby, Lawrence & Co P.206.

The work of Ibbetson, Williamson, Congreve, Fawcett, Evans and Earhart illustrates how the development of the Modular System benefited from the relevancy of the graphic output in addition to processes and methodologies disclosed by historical research into functional colour printing, but it also revealed how little of the Modular System is new. A recognised process can be found in printing history for even the most inventive strategies that occurred in the project – even if, as in the case of maculature and offset, they were originally identified respectively as subterfuge or mistakes. Digital technology facilitates re-interpretation: the work of Williamson, Ibbetson, Evans and Earhart was scanned, magnified and taken to the studio. The legacy of generations of letterpress printers has provided fixing and placing strategies adapted for the system, but its development has been executed with the aid of materials invented after relief printing and after the use of the platen press passed from mainstream commercial use. Polyethylene archival foam, polypropylene, magnetic matting and vinyl have been applied to basically unchanged relief printing techniques which span relief printing history, from its genesis in China with the hand-thump, to contemporary relief printmaking.

Acetal Resin, Linoleum and Vinyl

Relief printing is essentially an application of pressure, whether by hand or machine: it is the printing surface that informs the relief printing process. The transfer and offset processes developed with the Modular System utilise properties of the relief printing surface associated with the earliest hand printing. The printing of clay seals and charms which are the ancestors of relief woodblocks, together with specific features of ink-dab printing from stone stelæ, have direct pertinence to the development of the two different printing surfaces of the Modular System: rigid tint blocks and flexible compound matrices.

for the purpose of validation, seals were used in China from 1050 BC.[1] These seals, to which pressure was applied to emboss a substrate with or without ink are comparable to the alternately inked and embossed linoleum and vinyl surfaces developed throughout the project from the earliest experiments. Early seals also typify the enduring versatility of a relief printing block in that it can be printed upside down. This is an essential attribute for the offset printing between two printing surfaces that is exploited with the Modular System. Strategies adopted to deal with the resultant double *offset* prints have similarities to Chinese stone-rubbing and ink-dabbing methodology, developed between AD 176 and 670 in order to perpetuate Confucian text accurately. The process involves

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[1] According to Carter, seal use dates *from* the end of the Chou dynasty: (1027 to c 206 BC) and he cites p.15 two twelfth century scholars who deny the use of seals at all in the Chou dynasty. After the Chou dynasty, incised and fired clay seals were used to stamp into soft clay: for authentication, and to make early Taoist charms. Early in the Han dynasty (206 BC - AD 202) un-inked seals made a *bas-relief* of the incised cuts onto clay, to seal bamboo or wooden documents and their silk wrappings. During the Han dynasty, seals gradually developed into common use, carved from jade, gold, silver, copper, ivory, and rhinoceros horn, and with the advent of paper circa AD 105, were increasingly charged with vermilion in its natural form of cinnabar (mercuric oxide) as ink. The transition period featured bamboo and wood manuscripts sealed with clay, while paper documents had red ink impressions: with the incised characters: showing white on a red ground. 'clay impressions gave way some time about the fifth or sixth century of our era to inked impressions in red' p. 13
Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. p.p.13,113-15

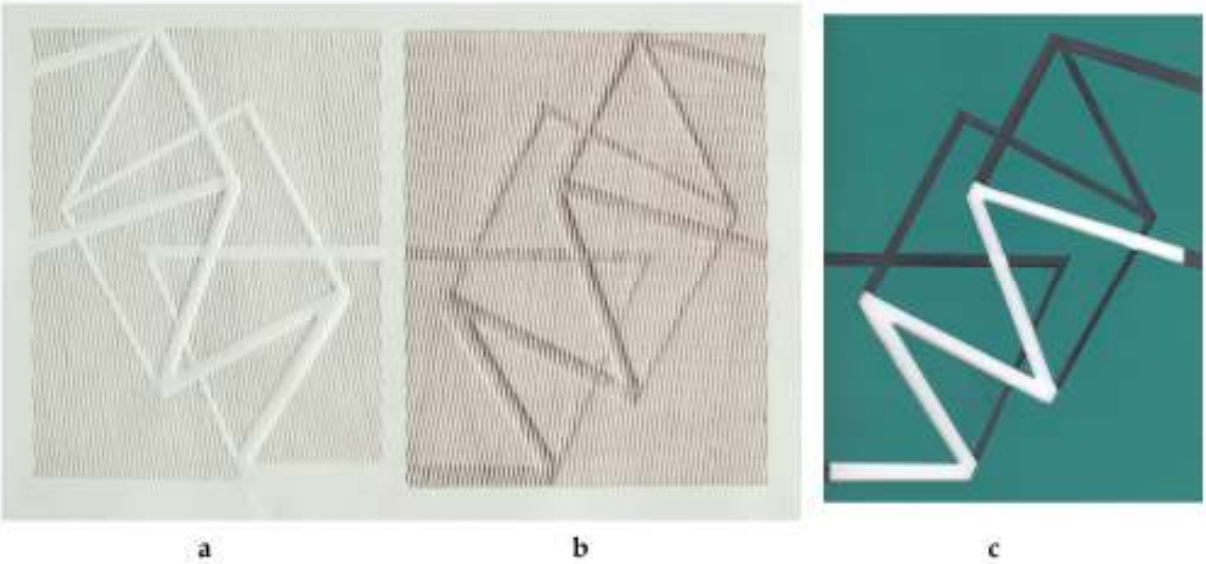

Fig 3:1 *Alberslines Nine 1*: print and vinyl printing surface: **a**) right side printed directly from vinyl, **b**) left side printed from a tint block after the offset from vinyl, **c**) the vinyl, right-reading to offset.

impressing into the front of a printed image, placed face-up over the printing block, and gave rise to an enduring printing methodology that has provided valuable guidance for the treatment of image reversal.[2] The stone rubbed print offers a right-reading version of the graphic content of the stone. Both offsets are printed in *Alberslines Nine1* (**Fig 3:1** p.58). The right hand impression **b**) is right-reading to the printing surface beside it **c**). The key to the exploitation of the unexpected, unplanned imagery printed from the second offset surface (a tint block), lies in the understanding that its orientation is right-reading to the printing surfaces. It is essential to embrace this concept, of a printed, exact copy of the printing block (which is alien to a Western relief printer), in order to maximise the potential of these accidental prints which have driven the experimental spirit of the project. To this end, Chinese stone dabbing methods of printing and embossing by tamping with brushes have informed the development of verso printing and de-bossing in the Modular System, where the offset prints are laid face up in the press and are right reading to the embossing block beneath it.

[2] Carter notes contention over whether the text indicates stone rubbings and conjectures that the date of the process may be closer to the earliest exigent stone rubbing, which dates from AD 627-49 – but that the practice predates woodblock printing. Ibid. p.20-21

Thus the efficacy of processes developed with the Modular System rely on characteristics evident in the simplest and earliest relief printing surfaces, which predate the use of a press: but they also depend on the greater amount of pressure that can be applied to a larger printing area *with* a press. It is possible to print two printing surfaces together under the substantial downward pressure exerted by a platen press, and the procedure is unaffected by one of the two surfaces facing upside down for printing. Engraved acetal resin blocks either receive or convey ink when impressed onto the flexible surface of linoleum or vinyl. A single inked surface produces printable offset imagery on both surfaces and the process succeeds whether the linoleum surfaces are left smooth, or incised with hollow woodcut tools.

The more specific titles of **tint blocks** for rigid surfaces and **compound matrices** for flexible surfaces reflect both appearance and function. The coining of names to describe printing surfaces and devices has proved unavoidable, but the intention is to facilitate identification. In a modular system, the storage, nomenclature and arrangement of component parts in what Tsuen-Hsuin (1983) calls 'retrievable order' is mandatory to minimise uncreative tinkering at the press. He is referring to the movable type systems of Pi Shêng in 1041-48 and Wang Chên in 1313, where labelling and identification strategies formed an important part of both specifications.[3] After introducing these printing surfaces, the two main categories of rigid engraved blocks and flexible substrates are detailed in separate sections, along with their graphic and methodological ancestry.

[3] Pi Sheng's clay type was arranged in paper labels, in rhyme-groups and kept in wooden cases. Wang Chen had similar strategies and detailed his cartwheel shaped type cases with woodcut illustration. Tsuen-Hsuin, T. and J. Needham (1983). Science and Civilisation in China Vol V:1, Cambridge University Press. p.202

Introducing the Modular System Printing Surfaces (**Fig 3:2 p. 61**).

Rigid Acetal Resin Tint blocks (**Fig 3:2a**)

a) The tint blocks are type-high engraved acetal resin blocks in various sizes and shapes that interact with all the flexible surfaces. They range from a 60mm circle, to a 252 x 205mm rectangle which clears the template size by a 12mm margin.[4]

Flexible Compound Matrices and Components (**Fig 3:2b** to **Fig 3:2e**)

The flexible surfaces are more diverse. Fabricated from either linoleum or vinyl, they are left smooth, or cut with woodcut and linocut hollow tools and can be various sizes and shapes within the template size (228 x 278 mm). Their more specific nomenclature reflects their different roles in the Modular System.

b) The compound matrices are the most complicated fabrications from cut, chamfered and joined linoleum or vinyl. The printing surface is usually left smooth.

c) The smooth components are the removable and replaceable parts of the compound matrices which have not been incised.

d) The cut components demonstrate how either the removable parts of the compound matrix components, or the tint blocks, can be replicated and cut using hollow tools in conventional linocut or woodcut fashion.[5] They are registered by replacement in compound matrices or placed in *kentōban*. The cut components (**Fig 3:2d**) specifically interrelate with the *Addon* group of compound matrices (**Fig 3:2e**).[6]

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[4] Although this measurement at 11 x 8 inches is more easily comprehended in Imperial, metric increments were specifically adopted throughout the project to minimise distracting mathematical intrusion.

[5] *Linocut* is used in the thesis to describe the traditional way that lino is made into a graphic printing substrate by the use of woodcutting tools: usually V and round gouges and knives. *Lino* is used to describe the uncut surfaces also used in the system. Linocut: 'A design cut in relief on a block of linoleum; a print obtained from this.' OED

[6] Prints from the *Addon* group can be seen at Fig 6:1 and the development of *Addon* in Stage V is described in Chapter 6.

Fig 3:2 The printing surfaces:
a) Tint blocks, **b**) Compound matrices, **c**) Smooth components, **d**) Linocut components, **e**) The compound matrix series *Addon*, which interrelate with all the linocut components at **d**).

The Adaptation of Materials for Printing Surfaces

Although acetal resin and linoleum were familiar materials (described in the Introduction), different properties were identified and exploited in the project. These were determined by the interaction of the two materials during transfer and offsetting processes developed with the Modular System. Printing the rigid and impermeable acetal resin tint blocks *onto* the flexible surface of linoleum identified flexibility as essential for offsetting and transferring purposes. Linoleum has been used throughout the research project, supplemented by Japanese vinyl in my later print experiments.[7] The generation of new approaches from adapting new materials has historical precedents in the use of linoleum for printmaking and in the further exploration of vinyl in the project.

Both linoleum and acetal resin were originally developed for other purposes and their adoption for printmaking had similar economic impetus. Linoleum cut more quickly and easily than wood and saved time as a consequence. The attraction of acetal resin lay in replicating high-quality, end-grain boxwood, an expensive and increasingly rare material. Linoleum, invented by Walton in 1860, was judged a generic term for cork and linseed oil based flooring material in the 1870s.[8] By 1907, in his article for *The Process Engravers' Monthly*, C. E. Dawson refers to its ubiquity. Dawson cut flooring samples dropped through his letterbox with woodcut tools to imitate the established relief process, and extolled the efficiency of linoleum as a wood substitute. However, he progressed to an appreciation of the specific characteristics of lino and recommended its suitability for

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[7] Peterdi refers to the efficacy of a flexible material such as linoleum and the unsuitability of wood due to rigidity, for offsetting onto an intaglio plate. Peterdi also suggests making a direct offset, onto the intaglio plate, with a roller charged from an inked linocut image. Copper plates from my MA study remain a future experiment with the modular system in association with vinyl. A disincentive to diversifying by applying the processes of the Modular System to intaglio was the necessity to interference with the fine adjustment of the intaglio rollers: or to implement two presses.Peterdi, G. (1971). Printmaking: Methods Old and New. New York London, Macmillan Collier-Macmillan. p.230

[8] p.23 A court case c 1870 mounted by its inventor Walton, failed to protect the unregistered trade-name on the grounds that the term had become ubiquitous. Powell, J. (2003). Linoleum. Salt Lake City, Gibbs Smith, Publisher.

making two-colour prints.[9] In adapting a material configured for an alternative function, and for colour printing, Dawson's actions parallel the development, before and during the project, of using acetal resin for engraving. Vinyl additionally plays a similar role in the development of the Modular System.

Acetal resin is a steel substitute designed for turning engineering parts and now used for security printing and for medical apparatus.[10] Its original adoption (explained in Chapter 1: Introduction) was to effectively imitate colour wood engraving. Although some advantages of its consistency were noted, the tint blocks have been configured by further exploitation of the characteristics of acetal resin. Their function in the system depends on the specific differences and advantages they offer over wood.

Japanese woodcutting vinyl appears to be a development from rubber for stamps. The material and the model of Western cast rubber stamps for commercial use had reached Japan by 1886. Possibly overlaid onto their tradition of cutting personal seals, Japanese *hankgo* or *inkan* were not cast however, but incised into the rubber.[11] The efficacy of a material devised specifically to pick up, and *set off*, maximum ink quantity by minimal hand pressure is invaluable for the system. When ink is offset between printing surfaces,

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[9] A two colour print formed the frontispiece of the original article. The article is reprinted minus colour frontispiece, as an addendum p.25 -36 to Dawson, C. E. (1907). Lino-Cuts: A New Method in Blockmaking for Posters and Other Bold Work; also for Making Tint-blocks for Two-Color. Wood Engraving and Poster-Block Cutting. B. Leland. London, George Routledge and Sons. p.28

[10] Ensinger Ltd, suppliers of acetal resin told me in 1992 that since my adaptation of the material, it had been used to print bar codes as a non-corrosive surface for security inks.

[11] According to the manufacture's website for *Gomu* or 'rubber board', the use of rubber had the same origin as European cast rubber stamps, in the invention of vulcanising by Chapel in 1879. The site states that foreigners are usually surprised to find the skilful engraving of commercial rubber seal-stamps rather than casting. *hoshinoinban.com/company/com _ 3.htm*
From personal communication with Nobu Arihisa, who also translated the web page, it has been used in schools for woodcutting for approximately 25 years. In Britain, Wuon-Gen Ho has used it for printmaking since 1995. She explained that it is a widely available craft material used for hand printing New Year cards.

a high contrast is sought: between the ink printed off onto the opposite printing surface and ink that remains undisturbed by the operation.

The adaptation of vinyl to the system follows the development pattern established by Dawson with linoleum. Originally deployed as a linoleum substitute, the specific properties of vinyl are directing technical innovation in the experiments with double-sided printing surfaces. The potential choice of printing images in either orientation has particular relevance for the Modular System where proofing increasingly produces workable images that are in reverse to each other. It is explained in Chapter 4 how configuring registration devices to maximise this potential in vinyl has specifically furthered the development of the Modular System with new materials and stratagems.

Acetal resin tint blocks Fig 3:3 (p.65).

The success of the offsetting process developed with the modular system depends on disparate graphic treatments of the two printing surfaces, and the tint blocks fulfil this requirement with finely engraved lines.[12] Their role demonstrates the retention of a relief engraving process, the ascendancy of the printing process, and that the development of the system has relied on the characteristics of contemporary materials. Acetal resin blocks are still engraved to generate tone and colour, but with a change of purpose.

Four oblong tint blocks 10, 13, 22 and 28, demonstrate how tint blocks are titled for block shape and tool size (**Fig 3:3**). Each block has been line-engraved with a specific tint tool, shown below it (**Figs 3:3a,3:3b**). The tool furnishes a single consistent printed tone which accords with Bewick's description (**Fig 3:3c**). Tint blocks of varying tool widths produce tone and colour by overprinting in the formerly established manner (described in Chapter 1). However, when transferred or offset onto additional linoleum substrates, they cease to be the sole graphic influence on the print, and the confines of the engraved block no longer delineate the edges of the print. The three images are printed from

[12] The blocks would be more aptly described as *line blocks* but this is already a printing term used to describe stereotypes.

Fig 3:3 Tint blocks: **a**) the first four 150x100 tint blocks 10, 13, 22 and 28.
b) Tint tools used to cut the blocks, from left: 10 13 22 and 28. No 28 is reground from a multiple tool.
c) Prints from Oblong Linear Tone Blocks 10, 13, 22 and 28 showing actual size of cut tints.
d) Prints using the oblong tint blocks: printed by offset transfer onto various *Pole* compound matrices.

various *Pole* compound matrices after receiving a transfer print from one of the four oblong tint blocks (**Fig 3:3d**). They demonstrate that variations in block size have moved engraved graphics out of the confines of a single block-edge and that the printed image can be spread or moved over the entire template size. The central print shows a tint block cross-hatching itself according to Bewick's concept, by twice offsetting oblong tint block 22 onto linoleum with 90° rotation.

The modularity of the tint blocks is due to the reversing action of offsetting and to their mobility. As they are no longer descriptive or single-purpose, the tint blocks are configured to maximise this modularity. Tint blocks can deposit a linear tone onto any of the flexible substrates in a steadily increasing variety of positions when used in conjunction with chases, *kentōban* and press furniture described in Chapter 4: Printing. This manipulation of tint blocks with Modular System components has moved printing into an inaugural role in the relief engraving process, as the graphic outcome of an engraved relief print can be configured either at the press or planned with proofs and furniture. Planning an engraved print can also proceed without engraving, as suitable blocks may already exist. Hand engraving tint blocks still takes time, but each block makes a permanent contribution to the tonal gamut available in the system. Additionally, the success of laser cutting and engraving acetal resin points to a future where printmaking with engravings could proceed without any hand engraving of a tint block.

The development of the Modular System is largely due to the exploration of the possibilities of the tint blocks and it is the combined imperviousness, durability and density of acetal resin that has facilitated this central role. The efficient function of the Modular System may depend on acetal resin engraved tint blocks, as boxwood would complicate procedures. [13] System efficiency has resulted in accelerating the creative cycle.

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[13] Jackson addresses the care, conservation and ambient temperatures for storage and engraving of boxwood and the irrevocable expansion particular to the use of turpentine on boxwood.. Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p 565 -7
This contrasts with the ease of care for acetal resin: blocks in the system are constantly being cleaned.

Ideas and working drawings can progress faster to the inauguration of new prints. As a growing bank of tint blocks continues to widen the possibilities, fewer prints require a long preliminary period of engraving.

The durable blocks have built a reliable and re-usable tonal system which is easily stored and not readily damaged. Acetal resin is impermeable to solvents and liquids which effects fast cleaning and enables efficient changes of block colour or function, allowing constant re-deployment. Acetal resin density (SG 1.54 compared to 0.91 for boxwood) facilitates accuracy for engraving and for registering multiple blocks, but has also contributed to the development of different applications for the tint blocks – which has widened the potential of engraved prints. The greater tensile strength of acetal resin supports finer, deeper, upstanding lines. This has had implications for both laser and hand engraving. The detail from an early laser engraving trial shows fine lines cut too deeply but remaining unbroken, even with the obligatory straight shoulder burnt by the laser nozzle(**Fig 3:4d**p.68).[14] The suitability of acetal resin to laser work has resulted in a number of laser engraved acetal resin tint blocks and a laser cut-through trial has been conducted (**Fig 6:17** p.168). For the print *Double Crosspatch*, laser engraved blocks were used (**Figs 3:4a,3:4b** p.68). With hand engraving, the tonal gamut of the system has been stretched by setting up and adapting bigger tint-tools to cut wider finer lines into acetal resin and includes two tools, no 22 and no 28 (**Fig 3:3b**). The largest tint block used for *Double Crosspatch* was engraved with tool no 28 and also printed with the laser engraved blocks shown in **Fig 3:4b**. The widest tint tool, no 29 was ground from a redundant multiple line tool and engraved the large circle (featured in the *Tabby Twenty Nines* prints **Fig 2:8d** p.44, illustrated **Fig 3:8e**). An animation made from the moiré exploratory proofs for *Tabby Twenty Nines* indicates a new function and direction for proofing and exploratory stages (**Fig 4:9** p.114).

[14] Hand engraving makes a chamfered edge to upstanding lines remaining. The tool profile which achieves this is discernable in Fig 3:3b. For laser trials see Addendum: Laser Cutting and Engraving.

Fig 3:4 Laser engraving: **a**) *Double Crosspatch* utilised 4 laser engraved tint blocks onto *Meander Grander* large linocuts, **b**) the laser engraved blocks used together with two hand engraved tint blocks: a circle and a second large block. **c**) print from trail engraving into acetal resin actual size, **d**) laser lines engraved too deeply show acetal resin strength.

Accurate re-positioning, offsetting and overprinting of tint blocks is facilitated by the density of acetal resin, as identically sized blocks universally register in *kentōban* and chases. For suites of multiple blocks, acetal resin furnishes clearer offset and transferred images than end-grain wood, and unlike wood, they can be dried by low heat. Imagery offset onto tint blocks is particularly clear due to the imperviousness of acetal resin which maximises ink set-off. This quality, also identified in vinyl, renders the exploitation of offsets from two printing surfaces viable.

Historical Ancestry of the Tint Blocks: Image, Function and Fabrication

Different historical precedents are found for the way the tint blocks function, their printed outcome and their fabrication. It has been seen in the Introduction that the engraving of lines to depict tone on end-grain woodblocks for letterpress printing is explained by Thomas Bewick, who pioneered the use of end-grain wood in printing. The format of the tint blocks reflects the long association of wood engraving with type.[15] The platen press is designed to function with what is still referred to as *type height* (23.3mm) and represents the exact thickness of wood blocks locked up with type. Type height for tint blocks has been retained to standardize the Modular System. A standard height that is compatible with the platen headroom expedites changing between thin flexible surfaces and thicker blocks for consecutive printing after offsetting these two surfaces together. Additionally, type height standardizes making-ready and embossing procedures explained in Chapter 5.

[15]'The great advantage which modern wood engraving possesses over every other branch of graphic art, is the cheap rate at which its productions can be disseminated in conjunction with types, by means of the press. This is the stronghold of the art' Jackson, W. A. C. a. J. (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p. 650 (p.737 in 1838 edition)

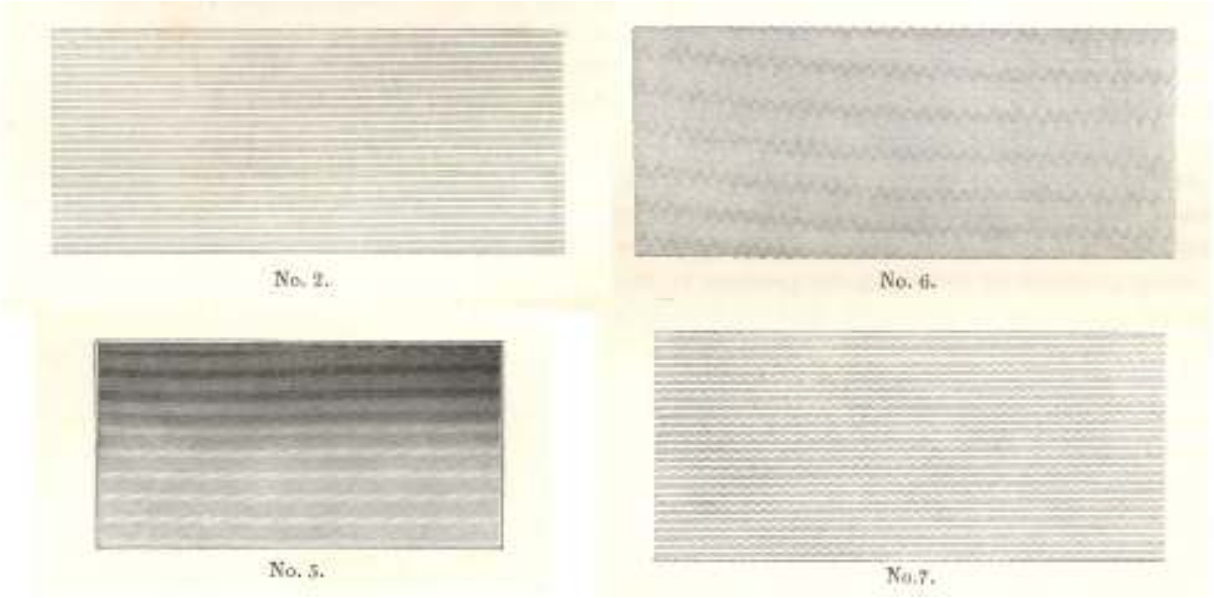

Fig 3:5 Tint cutting exercise examples from 1st edition 1839 Jackson (1838)

The illustrations from Jackson's *Treatise on Wood Engraving* (1839) (**Fig 3:5** p.70) resemble prints from the tint blocks (**Fig 3:3c** p.65)**.**[16] They were identically engraved with tint tools, but for a different purpose. Jackson's tints are engraving exercises for the interpretation of tonal washes and ink lines applied by illustrators, usually directly onto the woodblock. With the growing publishing industry, skill in imitating painterly tone and imagery employing black line was valued. Direct drawing onto the block remained throughout the history of relief engraving for illustrating and letterpress.[17] As wood washed with China white is a sympathetic drawing surface, this typical block preparation for an illustrator may have contributed to the fact that drawing continued to impose graphic demands onto wood engraving. Drawing and the perceived superiority of intaglio graphics, both black line media, had tedious repercussions for the jobbing relief engraver. Imitation of both these processes is exemplified in the importance and

[16] These are the earliest tint exercise found and are on pages 581-585 of the 1861 edition. Chatto, W. A. and J. Jackson (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight. p.659 – 665 The later manuals of Hope1882, Emerson 1881, and Marx 1881 all feature tint diagrams.

[17] Hind details the procedure with early woodcuts and explains that work on wood was often cut by carpenters following inked drawings. Hind, A. M. (1935). An Introduction to a History of Woodcut: with a Detailed Survey of Work Done in the Fifteenth Century, Dover reprint. p.17. The custom remained in Jackson's time but as he indicates that Papillon employ it shows that it was not universal. Chatto, W. A. and J. Jackson (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p.463

admiration afforded to the ability to engrave black line cross-hatching. Jackson (1839) claimed that it 'requires not only patience but also considerable skill to perform it in the proper manner, – that is, to cut each white space cleanly out, and to preserve the lines of a regular thickness.'[18] Bewick's concept of double blocks for cross-hatching, inspired by Dürer, was dismissed as a waste of time; however Papillon's similar suggestion came from experience.[19] A wood engraving from his *Traité historique et pratique de la Gravure en Bois* (1766), with a detail, shows his use of crossed black line (**Fig 3:6a**).[20] Papillon appended a little diagram, shown actual size and enlarged**,** to illustrate how relief engraved cross-hatching can clog with ink (**Fig 3:6b**). He suggested that two sets of parallel lines on double blocks would print cleanly.[21]

Similarly to this historical imitation of intaglio, the inspiration for *Tabby Twenty Nines* (**Fig 2:9** p.44, **Fig 4:9** p.114 **Fig 6:13** p.159) came from comparing Abraham Bosse's *Traicte* (1645) with the copy in Faithorne's translation *The Art of Graveing and Etching* (1662), to determine whether they had used the same copper plates (**Figs 3:6c, 3:6d** p.72).[22]
A proofing session with the circular blocks and chases was designed to exploit similar moirés and interference patterns evident in these intaglio examples. While comparing the two I noticed how much more Bosse had exploited the interference figure than Faithorne. This directly influenced my work – and produces an example of historical research furthering the graphic development of the practical project.

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[18]Chatto, W. A. and J. Jackson (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight. pp.681-83
The practice however always had its detractors. Bliss quotes Linton's (1883) observation that a four stroke cross hatch in pen or copper graver takes thirty six incisions into wood for a less lively result. Bliss, D. P. (1964). A History of Wood Engraving. London, Spring Books. p.5
[19] Bewick, T. (1961). A Memoir of Thomas Bewick Written by Himself. London, Cresset Press. p.189-191
[20]The darker Photographs are from the original edition. Papillon, J. B. M. (1766). Traité Historique et Pratique de la Gravure en Bois. (Supplément ... Tome Troisième.). Paris. p.1
[21] Ibid. p.109 I am grateful to Nina Williams for this translation.
[22] Bosse, A. (1645). Traicte des manières du graver en taille-douce. Paris Charles-Antoine Jombert. Plate 4. Faithorne, W. (1662). The Art of Graveing and Etching London, Faithorne. Plate 4

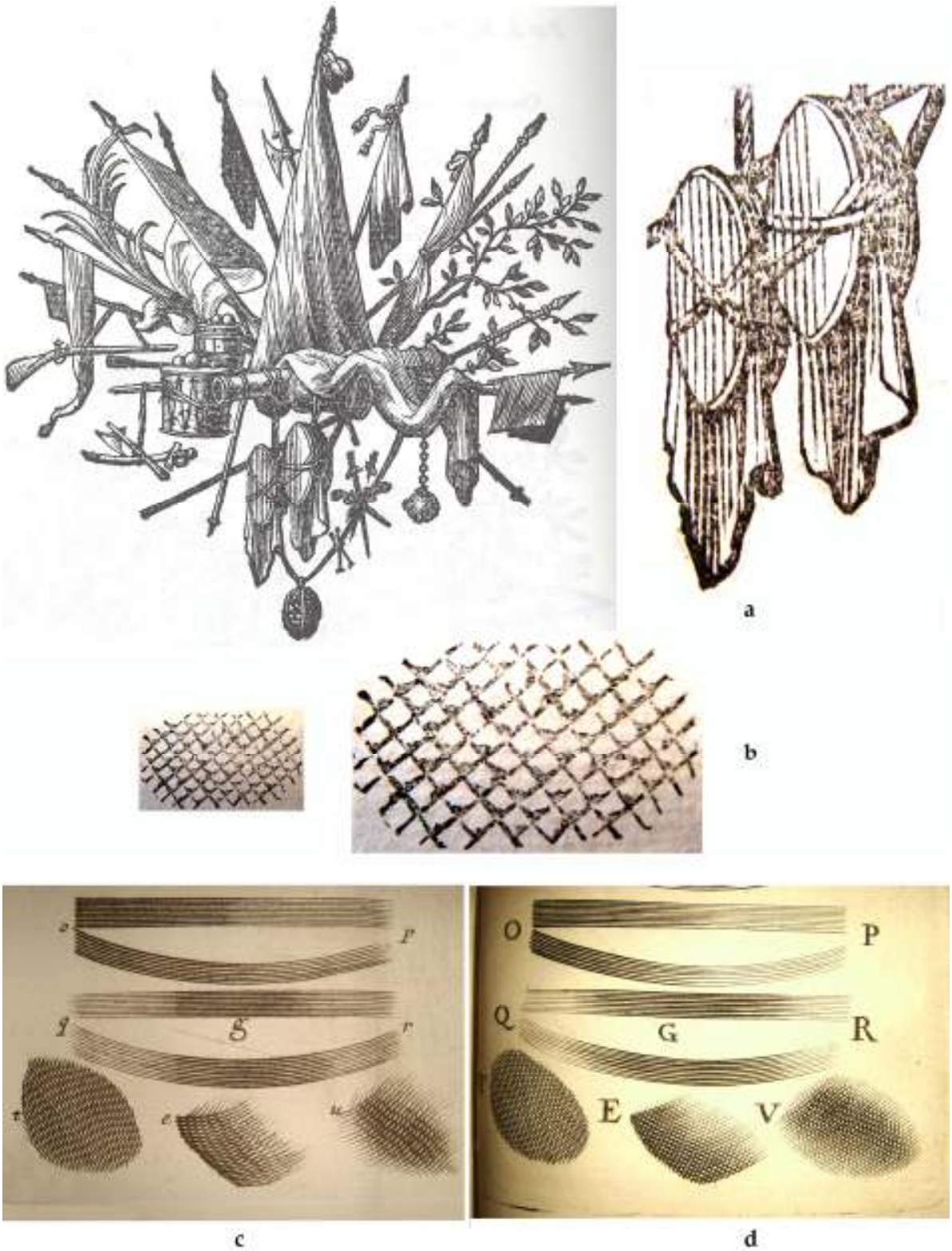

Fig 3:6 Cross hatching: **a**) Papillon mastered relief engraved cross hatching **b**) Papillon's diagram showing the hazard of relief engraving cross hatching: actual size and magnified. From *Traité Hhistorique etPpratique de la Gravure en Bois* (1766)
c) Bosse Plate 4 *Traicte de la Manière de Graver à l'EauFforte* (1645)
d) Faithorne Plate 4 *The Art of Graveing and Etching* (1662)

Modular Tints (**Fig 3:7** p.74).

The function of the tint blocks in the Modular System most exactly resembles Earhart's use of wood engraved matrices in *The Color Printer* (1890), explained in Chapter 2. Various tint-sheet block and textural devices for simple colour relief printing appeared during the late nineteenth century. Southward in *Modern Printing* (1899) describes a selection that includes Baker's Stencil Tinting Process.[23] A promotional pamphlet, inscribed by Baker and dated 1895, claims it 'a simple method of tinting small job work upon the platen machine dispensing with the necessity of having a block specially cut to suit every job' – which describes both the role of the tint blocks in the Modular System and the impetus to configure them. Baker's process relied upon wood engraved linear tone replicated in stereotype.[24] Stereotyping appears to form the basis of most tint grounds, whether patented or workshop-made. Earhart (1890) has a plate of stereotyped prints taken from inked book cloth that generate a tonal range for tints (**Fig 3:7a** p.74). Southward's instructions for making tint-sheets featured chemicals such as Epsom salts and oxalic acid evaporated on glass to form crystal configurations. These were impressed into wax and stereotyped.[25] The results may have resembled Earhart's Chaostype, mentioned by Southward in conjunction with examples of Owltype and Slenotype in his *Artistic Printer* (1892)**.** His description of their resemblance to 'marble, clouds, and other forms of crude and odd, and apparently an accidental character, producing a striking and sometimes weird effect' is insight into the Artistic Printer's agenda (**Fig 3:7b**).[26] However, both Earhart and Southward in devising tint ground schemes from printing and impression, provide precedents for the tint blocks and for the use of offset imagery in the Modular System – albeit once removed via the electro tank.

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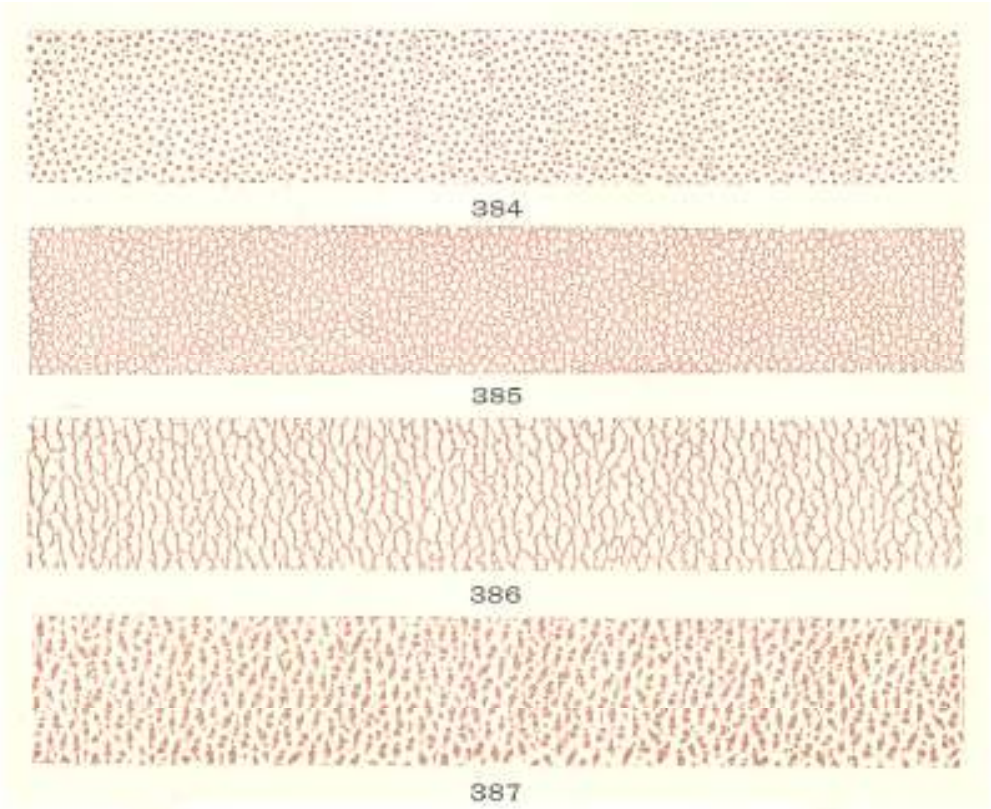
[23] Southward, J. (1899). Modern Printing: a Handbook of the Principles and Practice of Typography and the Auxiliary Arts. London, 4 pt. Raithby, Lawrence & Co pp.201-211

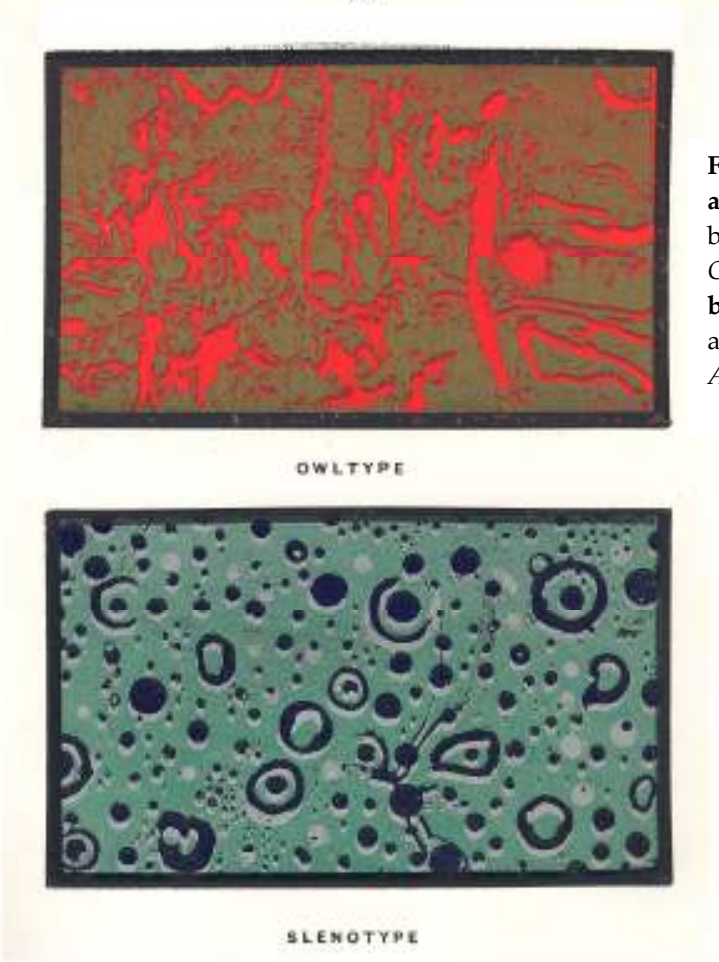
[24] 'Each Outfit consists of an Aluminium Frame, Electro of Lined Block, Supply of Covering Substance, and Pull Instructions,' Baker, J. (1895). Baker's Stencil Printing Process. Chipping Norton, Oxon, Jno Baker. Advertising Pamphlet

[25] Southward, J. (1899). Modern Printing: a Handbook of the Principles and Practice of Typography and the Auxiliary Arts. London, 4 pt. Raithby, Lawrence & Co p.202

[26] Southward, J. (1892). Artistic Printing. London, Printers' Register Office. p.92



a



b

Fig 3: 7 Stereotyped Tints:
a) Earhart from printed book cloth, plate 84 in *The Color Printer* 1890
b) Southward Owltype and Slenotype p.94 in *Artistic Printing* 1892

Tools and Machines

Tint tool size is directly related to the width of the line it engraves: thus a spread of tools represents a tonal gamut (**Fig 3:3b** p.65). The nineteenth century trade engraving tools that were adapted in the project to enlarge its tonal range, and which provided the means for further investigative experiments, were multiple lining tools – a nineteenth century development of Bewick's innovative two-line tool used for his diagrams described in Chapter 1 Introduction. The original state of the tint tools used in the practice since 1978 showed evidence of a trade engraver's calibrated tonal system. The numbered and grooved handles identified an incremental tonal scale, but the disparate tool lengths were evidence of their varying usefulness: many of the shortest tools are still regularly in my hand. The finest and wider multiple line tools were 2 to 3 centimetres longer than the average and almost too long for any hand – indicating rare, if any use and no sharpening. The incentive to grind the grooves off some of these tools lay in the quality of the old steel and the precise angle of the shanks for cutting straight lines of a prescribed width. Diamond shim and Japanese water-stones were used to keep the cutting end cool. The tang end, in the typical setting–up tradition taught to trade engraver apprentices, was ground on a wheel, heated and bent on a jig before plunging hot into the handle. [27]

Tools for precise repetition of lines were supplemented by ruling machinery for intaglio plates from 1790, particularly for technical illustration, and for skies.[28] Parallel lines cut into the wax based intaglio ground, leaving a tonal range for the intaglio printer to configure through biting and wiping. Machines appear not to have been widely employed to cut harder into relief end-grain woodblocks until the later half of the century. In his pages detailing tint cutting by hand, Jackson in both 1839 and 1861 editions mentions the occasional use of a machine: 'the sky in many of the large wood

[27] This is a typical example of trade knowledge that is rarely written down. Learnt in 1973 from Mr Fryer at John Cass College on apprenticeship day-release classes, setting-up formed the preliminary lessons for jewellery trade metal engraving.

[28] Dyson, A. (1984). Pictures to Print : the Nineteenth-Century Engraving Trade. London; Williamsburg, Va., Farrand Press. p.127

engravings executed in London is now cut by means of a machine' adding that 'In many steel engravings the sky is ruled in by persons who do little else.'[29]

John Holt Ibbetson may have been a pioneer in adapting his eccentric chuck for ivory-turning in 1817 to engrave on wood (elucidated in Chapter 2). The three editions of his *Specimens of Eccentric circular Turning*, from 1817–1838[30] feature identical wood engraved diagrams of stages for the turning of his Specimens (as in **Fig 3:8a** p.77). In the 1838 edition Ibbetson appended 'a description of *the identical Slide Rest and Chuck* with which all the Specimens I have ever worked out in pure Simple and Compound Eccentric turning, were actually executed and engraved.' The original five *Specimens* are augmented by seven wood engraved examples including Specimen VII (**Fig 3:8b** p77):

> intended to illustrate the Power of the Chuck to produce squares, oblong figures, and all figures that result from the combination of two right line motions, acting, alternately, at right angles to each other. The piece of wood, or other material to be worked upon in this case [from] a piece of box wood … being firmly chucked.[31]

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[29] The footnote also appears on p.556 in the 1861 edition – which keeps abreast of developments in other aspects of engraving. Chatto, W. A. and J. Jackson (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight.p.663
According to Bridson & Wakeman, Lowry invented a ruling machine for metal engraving in 1790 and further improved it in 1798. He adds that 'During the second half of the nineteenth century numerous patents were files for pantographs and enlarging machines, but there is little evidence of their use in book illustration.' Bridson, G. D. R. and G. Wakeman (1984). Printmaking & Picture Printing. Oxford, Plough Press. p.31

[30] An overview of the three editions:
Specimens in Eccentric Circular Turning 1st published 1817 by An Amateur. Six specimens, illustrated with copper-plate with small white-line woodblock developmental stages appended. No machinery diagrams, but explanation in the foreword that the equipment used to illustrate the turning was devised by author.
Specimens in Eccentric Circular Turning 2nd edition, 1825 Ibbetson named as author and additional copper plate diagrams of machinery for turning.
Specimens in Eccentric Circular Turning 1838 Extra plans and elevations of the different machinery used to make the copper plates and wood engravings. In the introduction Ibbetson is at pains to point out that it differs from the machinery used to make the pieces (which was available at Charles Holtzapffel) and that he devised and constructed the means to machine-engrave the specimen diagrams himself.

[31] Ibbetson, J. H. (1838). Specimens in Eccentric Circular Turning, with Practical Instructions for Producing Corresponding Pieces in the Art. London : Longman, [1835]. p.iii, p.152

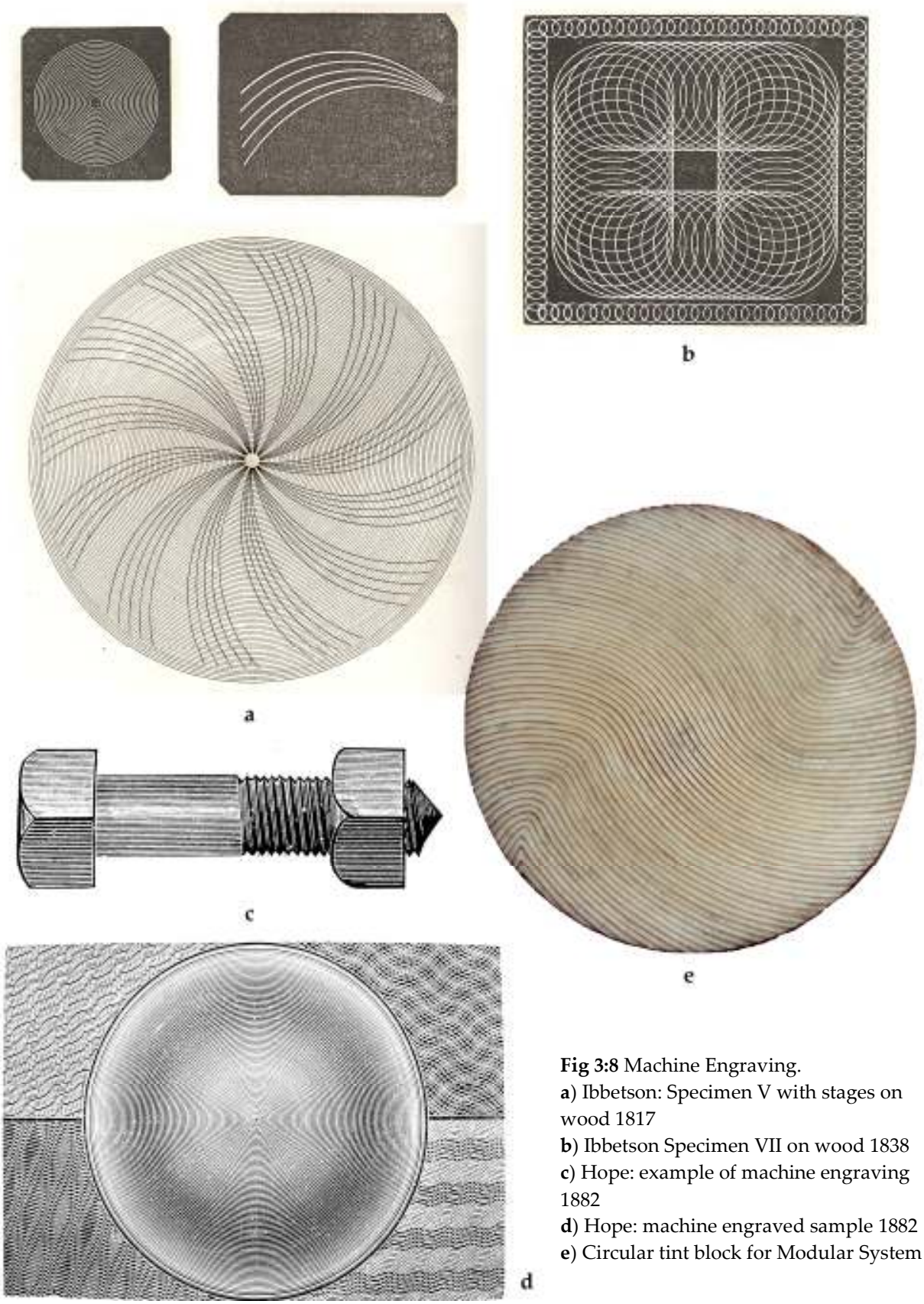

Fig 3:8 Machine Engraving.
a) Ibbetson: Specimen V with stages on wood 1817
b) Ibbetson Specimen VII on wood 1838
c) Hope: example of machine engraving 1882
d) Hope: machine engraved sample 1882
e) Circular tint block for Modular System

Ibbetson's *Specimens* influenced the practical project both graphically and technically. His machine wood-engraved devices inspired the inclusion of circular tint blocks in the Modular System and the adaptation of tools. The large no 29 circular block represents the commencement of an exploration of tonal curvature directly derived from Ibbetson's *Specimens* (**Fig 3:8e** p.77). Although Ibbetson's apparatus is too technical for adaptation in the Modular System, it instigated the simpler solution of the circular chases that are described in Chapter 4: (Printing: Kentōban, Chases and Furniture).

The use of a machine to prepare the printing surface for printing (and which is capable of instigating part or whole of the graphic imagery) is relevant to a project which uses a secondary printing surface to produce preparatory graphics, to transfer imagery, or even to create the entire printable image. Additionally, the investigation of laser engraving in the latter stages of research invites a direct comparison with ruling machinery. Skilful engravers could hide the use of a machine.[32] However, most historic comment on the development of wood engraved illustration into a commercial production line with its use of machine – like repetition is pejorative. Hope's examples and his report in his *Manual of Wood Engraving for the Amateur* of 1882 conveys a rare enthusiasm for a device '…that greatly diminished the labor of the engraver, namely, a ruling machine. These are capable of doing tint work, such as plain, wave, circle and watered, skies, etc.' (**Fig 3:8c** and **Fig 3:8d**).[33]

The use of the machine-cut line and its hand engraved imitation made two disparate contributions to printed graphics. In at least one possibly isolated example, the clarity of machine ruling for diagrams and machinery contributed to it lasting well into the

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[32] p.37'The very regular nature of some parallel-line tints in Fawcett's colour blocks suggests that they were ruled, or possibly cut, with a ruling machine but we have no confirmation of that.'
Gavin Bridson referring to Benjamin Fawcett: p.37 Bridson, G. (1988). Colour Woodblock Techniques Benjamin Fawcett : Engraver and Colour Printer: with a list of his books and plates. . R. McLean. Aldershot, Scolar Press**:** 35 - 40.

[33] p. 37 Hope, A. (1882). Manual of Wood Engraving for the Amateur. Chicago, Colegrave Book Co.

twentieth century.[34] However, although machines were not widely used for book illustrations, the effect of such hand linear tonal engraving on illustration must have contributed to the often reported uneasy relationship between artists and engravers.[35] Nonetheless, it may be mooted that the use to which the inventions and practices were put were the more deserving subjects for opprobrium than the actual process – as in Bewick's dismissal of imitation cross-hatching. Initial practical experiments in the project addressed the question of how tone cut by tint tools could be exploited for printmaking – and in a manner more economical of time. From the answer sprung the idea of a system: to make modular engravings which were no longer single-use: but it was expedited by a lack of prejudice for a process which no longer despoiled artist's work, nor elucidated the workings of machinery. Additional research has established laser-engraving as a contemporary equivalent of the ruling machine and a potential tool with which to build a tonal gamut. The similarity of a tint-tool linear tonal system to variations of burn velocity, line-space and angle of linear grids has been noted in early experiments. An actual-size detail from the first laser engraved acetal resin sample features the same line, engraved with altered burn velocity and power settings (**Fig 3:4c** p.68).

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[34]A personal communication from Mr Stanley Lawrence in 1979 complied with childhood memories 1954–1960s of regular newspaper advertisements for a jewellery firm, Angus and Coote of Sydney that depicted rings etc in white line. Mr Lawrence volunteered that his firm, T N Lawrence and Son, supplied blocks to Angus and Coote up to the 1960s. This use of machine engraving for jewellery may have been more widespread: the ruling machine that Mr Frampton of Clerkenwell Road owned and used until 1980 has an accompanying folder of ruled examples that mainly consist of jewellery specimens (now in the possession of Ian Mortimer). The machine, from personal use 1991, engraves more finely and evenly than laser.

[35] All the following address the relationship of artists with engravers and the causes of friction lying with the interpretive nature of the procedure. Chatto, W. A. and J. Jackson (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight.p.685

White, J. W. G. (1906). English Illustration. 'The Sixties': 1855-70. London, A. Constable. p.ix

Thorpe, J. (1935). English Illustration: The Nineties. London, Faber and Faber. pp.5-10

Goldman, P. and C. British Museum. Robin de Beaumont (1994). Victorian Illustrated Books: the Robin de Beaumont Collection. Boston, D.R. Godine. pp.67-68

Linoleum and Vinyl Flexible Printing Surfaces

The pliancy found in linoleum and vinyl is essential for offsetting images from the rigid acetal resin tint blocks and it was this characteristic in linoleum which initially led to offsetting stratagems (**Fig 3:2b-d** p.61). Flexible printing surfaces easily print *together* for offset images, but if two different printing materials are used, one of them must be flexible. In **Fig 3:9** the linoleum *Meander Magna* motif **b**) received ink from oblong no 10 tint block **a**). In addition to the image reversal demonstrated with *Alberslines* (**Fig 3:1**p.58), the two printed offsets exhibit tonal inversion. The residual ink already set-off to the linoleum in prints light, while the unprinted ink over the linoleum incisions prints dark (**Fig 3:9c**). The tonality contrasts with the predictable, reversed white line print from the linocut (**Fig 3:9d**). However, instead of printing solid black, the uncut surface supports the linear tonality of the original tint block (**Fig 3:9a**). The unpredictability of imagery created by printing the tint blocks together with the other surfaces has driven the experimental project and has not abated with continued experience of the process.

As the linoleum can receive an offset from any extant tint block, the process enables linocuts to change tone in addition to colour. This renders linoleum printing surfaces largely responsible for the variety and individuality of the prints produced by the Modular System The ease with which a linoleum component can be cut, replaced, copied or abandoned has facilitated experiment. This efficient fabrication accelerated the building of stock for the system and the development of processes using embossing, offsetting and transferring described in Chapter 5: Development of the Modular System.

The addition of Japanese woodcutting vinyl in the latter stages of the project has indicated future directions for the expansion of the Modular System and demonstrates how developments inaugurate rather than complete exploration. The material can be printed on both sides. The green side is evident in *Alberslines Nine* (at **Fig 3:1c** p.58 and in **,Figs 3:2b,3:2c** p.61). The blue side is shown in *Curly Journey* (**Fig 3:10c** p.84). This has triggered the development of magnetic holding devices (described in Chapter 4).

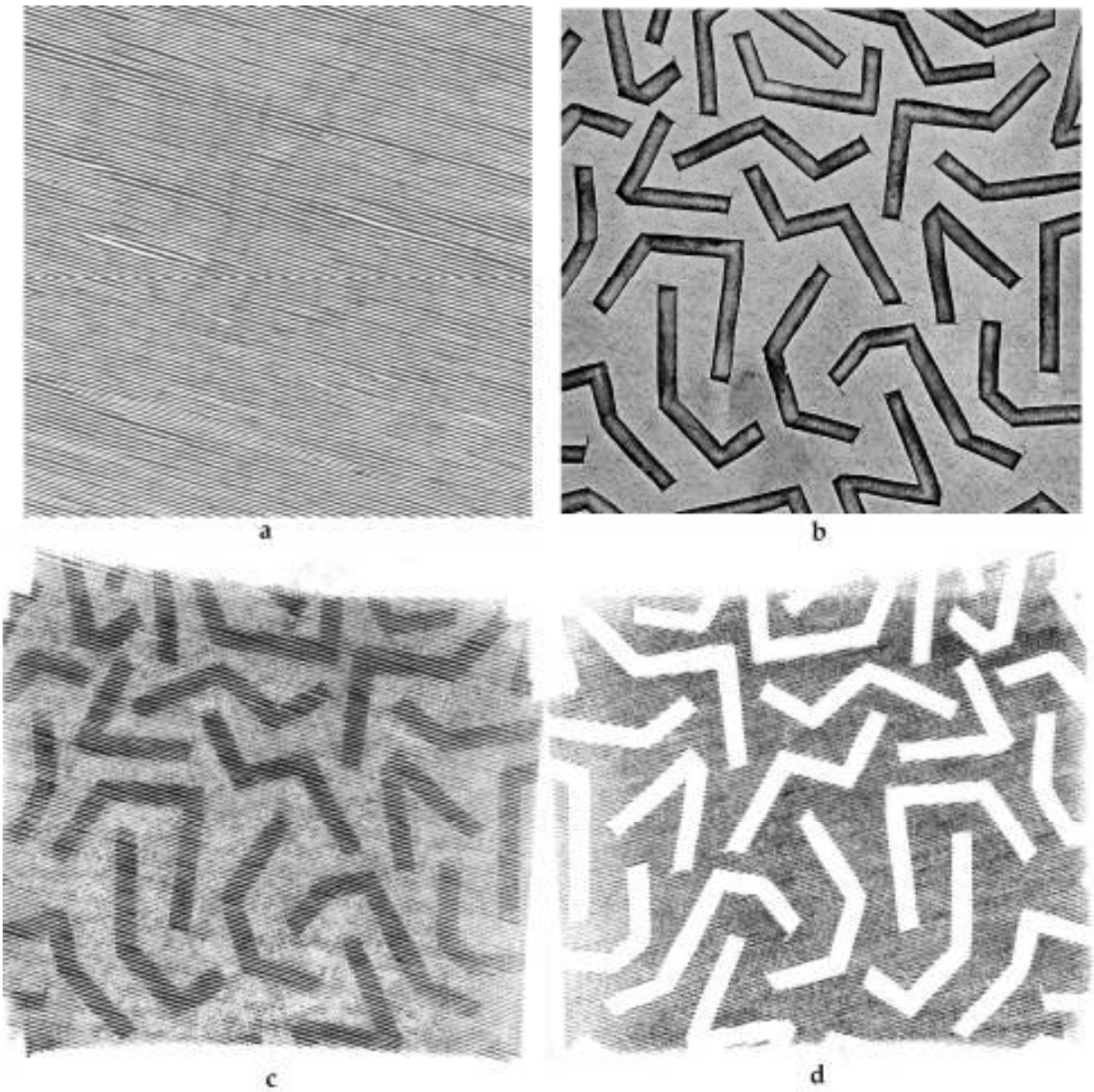

Fig 3:9 Offsets from printing two surfaces together are tonally inversed.
a) Tint block that was inked and printed onto the *Meander* linoleum
b) Linoleum *Meander* that received print from the tint block .
c) Print from tint block showing residual ink inversing the tonality of the original cut
d) Print from linoleum showing linear tone.

However, as it is also possible to incise the magnetic mat with hollow tools, a future possibility is to configure the registration material for cut components.

The compound matrices and cut or smooth components.

The compound matrices and the components, whether left smooth or linocut are interactive and interchangeable. The compound matrices have spaces into which the smooth components fit (**Figs 3:2b**, **3:2c** p.61). The linocut squares and strips are likewise accommodated in the *Addon* series of compound matrices (**Figs 3:2d**, **3:2e** p.61). This demonstrates how the compound matrices are the most modular of the flexible substrates and that the components are their removable and interchangeable parts. They are named for their similarity to the historical compound printing plates of Fust and Schoeffer (1457) and Congreve (1819), but their relative simplicity has more in common with Ibbetson's divided blocks discussed in Chapter 2 (**Fig 2:7**p.39). Linoleum compound matrices are partly backed onto polypropylene sheets, whereas vinyl compound matrices are cut and jointed, but remain un-backed.[36] All compound matrices are template size (228 x 278 mm), making the entire printing surface available for either holding cut components substituted for their removable parts, or for receiving an image offset from tint blocks.

In addition to flexibility, the compound matrices depend on a material with a capacity for inlaying and joining. The composition of lino facilitates cutting into outlined shapes and strips with a knife and for component pieces to be removed, copied, inlaid, or easily glued. In a similar manner to their historical forebears, the parts of the lino which are backed onto transparent polypropylene sheet and the cut negative spaces left in vinyl sheet become registration tools, by enabling accurate replacing for overprinting. As vehicles for embossing, offsetting, and for the placing of various components, they provide methods of moving shape, texture, tone and colour around the paper substrate.

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[36] Gerprint 800 micron polypropylene, from the London Graphic Centre: cuts easily and accurately: used for model making.

It is the singular surface of these jointed lino blanks which, by holding a transferred printed image from the tint blocks, have contributed to major developments in the system: but have additionally solved dilemmas taken to the project from the previous practice. The procedure breaks the boundaries of the transferred engraved blocks and moves the potential graphic animation of the print to the entire paper surface. A single compound matrix, by holding a variety of cut components, changes the printed image, as the *Pole* series shows (**Fig 3:3d** p.65), and the *Addon* compound matrices and related components demonstrate (**Fig 3:2d** and **Fig 3:2e** p.61). Further *Addon* development is featured in Chapter 6.

As the vagaries of reversal and tonal inversion continued to drive the development of the Modular System, the properties of vinyl proved particularly suitable for further development of both compound matrices and cut components. In addition to colour coding – reversed (blue) or original imagery (green) – vinyl has particular relevance to the system when incised with hollow tools. Unlike pale grey linoleum, which can be surface darkened to show incisions as a white line in an echo of Bewick's schoolboy slate, and thus to indicate the potential of a conventionally printed *linocut*, the dark vinyl core shows incisions as darker than the coloured surface: visible in **Fig 3:1c** (p.58). The graphic potential of vinyl lies with assisting in an awareness of the ambivalence of incised lines into a printing surface that may be offset and therefore tonally inversed. The requirement to develop imagery with reversed orientation makes the double sided vinyl an attractive addition to the Modular System, but additionally, a reversed version of a compound matrix is obtained by flipping it over. This is in contrast to the necessity of re-cutting and fabricating a linoleum compound matrix in reverse: and it is also easier to cut vinyl accurately and perpendicularly with a scalpel blade.[37]

[37] Vinyl should not be laser cut. Although experiments were undertaken at Bristol UWE 22-23 October 2009 with sufficient ventilation for safety, the release of cyanide gas by the burning process corrodes the laser-head. Linoleum has exploration potential for laser cutting but due to the bend in linoleum sheet, considerable wastage in the need to weight un-mounted lino sheet for laser cutting needs consideration.

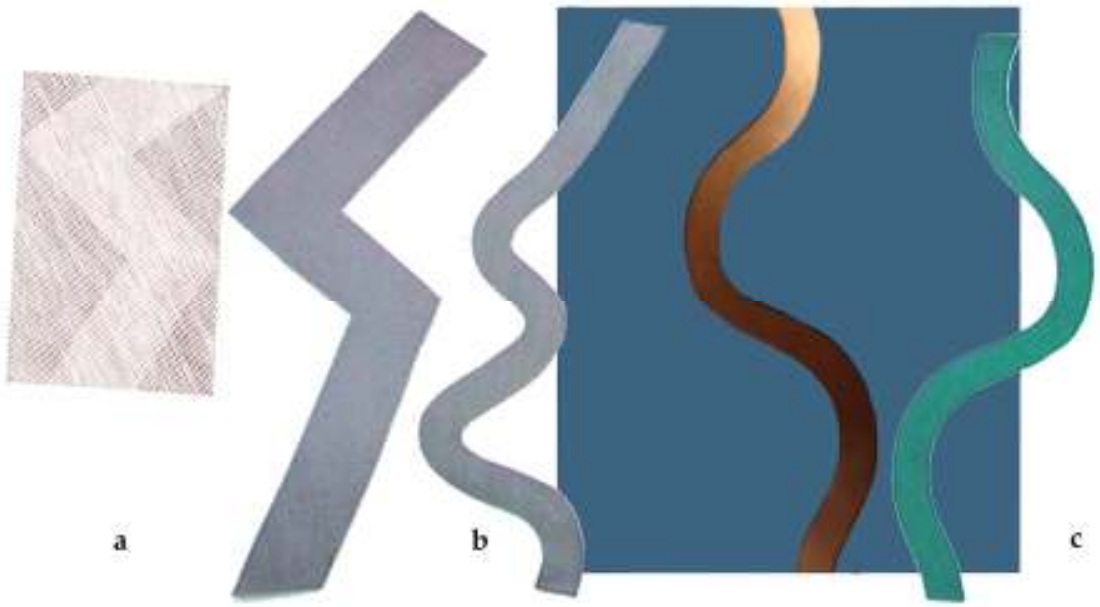

Fig 3:10 Smooth components: **a**) Print from a tint block after an offset from *Sharp Trend*, shown at **b**) with *Flowing Trend*, **c**) *Curly Journey* with *Path* component

The Smooth Components, as un-incised removable and replaceable parts of the compound matrices, are receptors for offset imagery: usually from tint blocks (**Fig 3:2c** p.61). They can be removed, extracted after offsetting and replaced, or they can be printed on their own in *holding compounds*. These replicate the glued parts of compound matrices in polypropylene sheet and magnetic matting and are detailed in Chapter 4. An example of a smooth component held in register for printing with a holding compound is the red stripe of *Crossed Pole* (**Fig 3:3d** p.65). Some of the most unexpected avenues for pursuit in the project have been indicated by proofs from a smooth component offset onto a tint block. In addition to picking up a linear tone onto its surface, the smooth component leaves a strongly graphic offset image on the acetal resin tint block. Such a residual print can be seen from a *Sharp Trend* (**Fig 3:10a** p.84).

The smooth components have been developed in the project mainly from linoleum as adjuncts to compound matrices. The *Trends* compound matrix is an example of the suitability of vinyl for smaller and curved removable components. It is not possible to

replace the linoleum *Flowing Trend* (**Fig 3:10b** p.84). It has been printed in a holding compound for the *Trends* series (**Fig 6:11** p.157) – whereas the *Path* in *Curly Journey* is easily replaced in vinyl (**Fig 3:10c** p.84).

The cut components contribute more specific and narrative graphic imagery to the system due to their character as traditional linocuts. The shapes replicate the tint blocks or match the movable parts of the compound matrices (**Fig 3:2d** p.61). They fit into the same spaces to move specific areas of tonality and shape around the paper substrate. They present more specific results from receiving transferred tint block prints, and are the source of variety when used with compound matrices, as in the *Addon* series.

Historical precedents for the Compound Matrices

The ancestors of the compound matrices, with their removable, interchangeable parts, are the probable plates used for the earliest European colour printing. The two-colour initial letters of the Mentz Psalter of 1457 are believed to have been simultaneously printed from a set of two interlocking interchangeable plates, and accompanied some of the earliest printing with movable type only two years after Gutenburg's 42 line bible (**Fig 3:11** p.87). His ex-associates Fust and Schoeffer fitted the red and blue initial letters into their traditional places for a fifteenth century illuminated manuscript with such ingenuity that their exact process has remained a mystery. It appears that the time needed, and the successful progression of printing as a medium which did not need to imitate illumination, put paid to the care and attention expended in order to print bi-coloured initial letters. Fust and Schoeffer had reverted to hand colouring by 1460, although the letters continued to be used in various liturgical editions from their publishing house, in different combinations of colour and plate arrangement, until 1502.[38] The innovation, in order to imitate hand painting, produced the earliest European colour

[38] p.46 'the color printing method used for liturgical folios was time consuming, too complicated, altogether too impractical, to be used for other types of books.' Lehmann-Haupt, H. (1950). Peter Schoeffer of Gernsheim and Mainz; with a List of his Surviving Books and Broadsides. Rochester, N.Y., Printing House of L. Hart.

relief printing, but the process has never been conclusively proven.[39] It is this earliest manifestation of probable compound printing which established a precedent in the project, and for a *modular* compound printing system. Over the brief period of their use, the initial letter plates were printed in various combinations: of colour and of joined or separated parts. **Fig 3:11a** (p.87) shows a theoretical conception of compound plates for the letter 'o'.[40] The Psalter initials link attempts at colour printing from the fifteenth century via Funcke's earliest and graphic explanation of compound plates for decorative colour printing in his manual of 1740, to the early nineteenth century (**Fig 4:3** p.101).[41]

All the examples in **Fig 3:11** (p.87) are facsimiles. They show how the initial B from the first page of the Psalter of 1457, with its continuously perfect colour registration, was a benchmark for showcasing printing invention, but also demonstrate the interrelating colour printing innovation of the early nineteenth century. They illustrate that colour printing in its exploratory stages was already imitating actual colour printing: the preliminary graphics for these facsimiles were diverse existing prints. This is most clearly understood by working backwards in time: from **Fig 3:11b** (p.87), the initial letter printed by T C Hansard (1776–1833) in 1825[42] – which is from two stereotyped plates and 'possibly the first time a coloured illustration had been printed in this way.'[43]

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[39] Most sources cite Didot as giving the most conclusive evidence His assumption, in a footnote, p.106 is that the extra drenching and dampening required to print vellum precluded printing in two different sessions with any possibility of registering correctly - and which he noted is always perfect Firmin-Didot, A. and C. Vecellio (1863). Essai Typographique et Bibliographique sur l'histoire de la Gravure sur Bois. Paris, [Typographie de Firmin Didot Frer & Fils].

[40] The conceptual plates is by Heinrich Wallau. Different manifestations of the parts are explained and include the surrounding decorative border printed alone in 1515, and the use of the inner part of the letter mounted type – high in1502. Lehmann-Haupt, H. (1950). Peter Schoeffer of Gernsheim and Mainz; with a List of his Surviving Books and Broadsides. Rochester, N.Y., Printing House of L. Hart. pp. 41,46

[41] Addendum to 1st edition, p106-108 Funcke, J. M., J. Mosley, et al. (1740,1998). Kurtze Anleitung von Form-und Stahlschneiden. Darmstadt, Lehrdruckerei der Technischen University of Darmstadt.

[42] Hansard, T. C. (1825). Typographia: an Historical Sketch of the Origin and Progress of the Art of Printing. London, Baldwin Cradock and Joy. p.193

[43] Wakeman, G. and G. D. R. Bridson (1975). A Guide to Nineteenth Century Colour Printers. Loughborough [Eng.], Plough Press. p.54

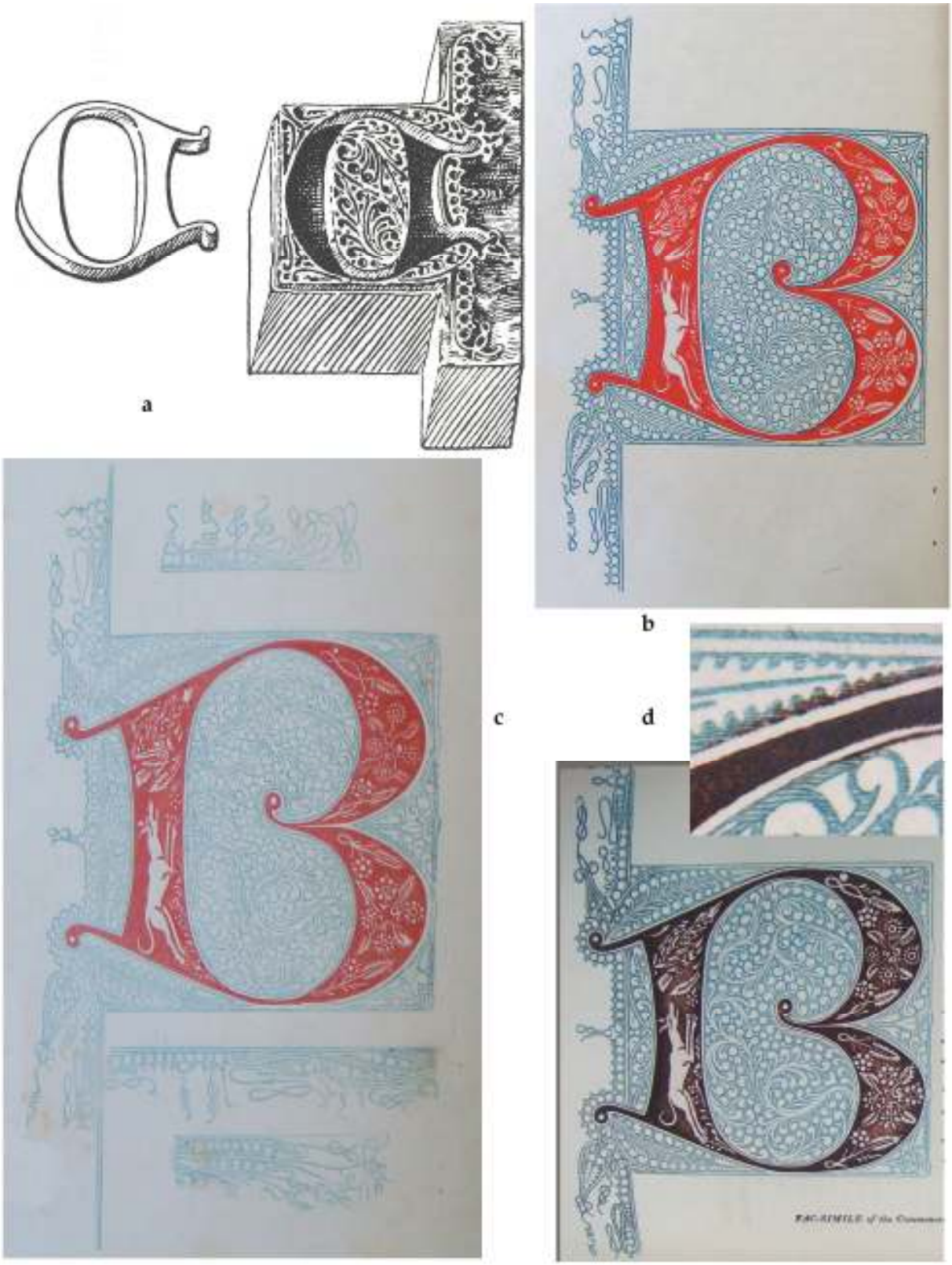

Fig 3:11 The Mentz Psalter initial B and colour printing innovation **a**) Reconstruction by Heinrich Wallau of probable compound plates 1950, **b**) First stereotype colour printing, T C Hansard 1825, **c**) wood engraving by Mary Byfield for William Savage 1822, **d**) T H Dibdin printed by Savage1814

Stereotyping, which was readily available to the jobbing artistic printer for making tint grounds at the end of century, had had 'a renewed commercial application' at its beginning, according to Mosley in reference to Funcke's knowledge of the process as early as 1740.[44] In his *Typographica* (1825) T. C. Hansard claimed that Thomas Hodgson's *Essay on Stereotype Printing* (1820) was published 'since these pages were first compiled' and explained that he had not seen an original Mentz Psalter. However Hansard was familiar with the image from a number of sources and mentioned that 'Akerman, in his frontispiece to *Senfelder's History of Lithography* (1819) has given a copy… as a specimen of lithographic printing in colours' and that Horne's black and white letterpress version in *An Introduction to the Study of Bibliography* (1841) was uncoloured.[45] Hansard states that the lines of his image were copied from the *Bibliotheca Spenceriana* of T. F. Dibdin (1814) but that he added more accurate colour (**Fig 3:11d**).[46] The colour resembles the wood engraved initial from William Savage's *Practical Hints on Decorative Printing* (1822) (**Fig 3:11b**). Both of these images were printed by William Savage.

The single colour plate in the four volume work by Dibdin is in the first and only volume printed by Savage (**Fig 3:11d**).[47] The detail shows evidence of a single engraving that may have been dolly printed: which accords with one of Savage's working methods in the use

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[44] Funcke, J. M., J. Mosley, et al. (1740,1998). Kurtze Anleitung von Form-und Stahlschneiden. Darmstadt, Lehrdruckerei der Technischen University of Darmstadt. p.74

[45] Horne, T. H. (1814). An Introduction to the Study of Bibliography. London, T. Cadell and W. Davies. p.251

[46] Akerman followed Senfelder (1818) who he was translating, in having a lithographed frontispiece of the initial B. Hansard wrote about Savage and owned his book, now in the National Library of Wales. Hansard, T. C. (1825). Typographia: an Historical Sketch of the Origin and Progress of the Art of Printing. London, Baldwin Cradock and Joy. pp ix, 2, 45-49, 913

[47] Savage printed, without a partner, from Bedfordbury Covent Garden1808 – 1810.
Wakeman *Guide to 19th Century Colour Printers*: p.92 The other Dibdin volumes were printed by W Bulmer – who like Dibdin was also a subscriber to *Practical Hints*. The possibly dolly-printed smears were spotted by Paul Croft.
Dibdin, T. F. (1814). Biblioteca Spenceriana vol I or A Descriptive Catalogue of the Books Printed in the fifteenth Century, and of Many Valuable first Editions, in the Library of George John Earl Spencer K G London, Shakespear Press: Longman, Hurst, Rees, & Co.; T. Payne;White & Cochrane; John Murray; J. & A. Arch. p.108-117

of small ink balls for confined areas of colour.[48] In his *Practical Hints on Decorative Printing* (1822) Savage declared that his wood engraved version was a true copy from a Psalter (**Fig 3:11c** p.87). His dilemma, in discovering that this was not the case, is an example of the limitations arising from the confines of an engraved relief block. Like Bewick's *Greenshank* (**Fig 1:3** p.7), Savage had to fold up the tendrils of the printed illumination to fit the available uncut space of an end-grain woodblock. He had discovered that despite arranging for a tracing of the Spencer Psalter and commissioning a drawing from Thurston, the artist had also used Dibdin's version with its attenuated tendrils – which might have given the game away (**Fig 3:11d** p.87). Savage arranged for the engraver Mary Byfield to amend the work.[49] This may explain why the tendrils in **Fig 3:11c** are broken and fitted into the wood block area as spare parts**.**

The modularity of compound plates, exploited by Fust and Schoeffer was similarly utilised by Branston and Whiting using Congreve's patent. Greenland (2009) gives examples of how they interchanged colours and plates for different clients and purposes between 1825 and 1839, citing lottery tickets and writing ink labels: 'different contractor's names appear on lottery bills of the same design,' and 'the central portion of a handbill printed for the lottery in April 1825 was modified about fifteen years later for to make a label for Arnold's Marking Ink.' For the last lottery in 1826, 'Hazard's was green and brown, and Bish's brown and blue.' a medallion which formed part of the design was later submitted by Whiting as one of several samples to the Treasury Competition in 1839, for a new postage stamp, and 'the central motif also appeared in the Royal Almanack in 1828'.[50]

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[48] Savage, W. (1822). Practical Hints on Decorative Printing. London. p.58

[49] Savage attests to the verisimilitude of his primary source on p50 -51 of *Practical Hints*.
'The Letter B, from the Psalter of 1457. Drawn by Richard Thornton, and engraved by Mary Byfield. Mr Thornton engaged to trace this letter from Earl Spencer's copy of the Psalter; but after it was engraved I discovered that it had been copied from the one in the Reverend Dr. Dibdin's "Bibliotheca Spenceriana", in consequence of which Miss Byfield had to alter the engraving, to make it like the original.' Savage, W. (1828). Miscellaneous Collections of Engravings in Relief, John Rylands University Library p.7 no 9

[50] Greenland, M. (2009). "Whiting and Branston's Lottery Printing." Journal of the Printing Historical Society **13**(New Series): 61 - 79. p. 63 Figs 7 - 9

Fig 3:12 Development of the *Meander* motif & Large Linocuts
a) *Meander*
b) *Meander Magna* positive & negative
c) *Meander Grander*
d) *Meander Macro* laser cut acetal resin

Modularity and the Evolution of the Large Linocuts: the *Meander* Motif (**Fig 3:12** p.90)
The compound matrices and their components in the system followed the historical pattern of interchanging colour and components, but the replaceable parts that were linocut gradually grew – until they covered the whole template size. The modularity of these large linocuts lies in where and how specifically narrative graphic imagery is extended: by offsetting from tint blocks in *kentōban,* by applying embossing foam, or by localised inking. The evolution of the large linocuts from smaller components demonstrates how printing has driven the development and influenced the structure of the Modular System. This is exemplified by the *Meander* motif – a chaotic (non-repeating) pattern that has continued to evolve throughout the development of the Modular System.

The various *Meander* versions shown in **Fig 3:12** evolved from printing and offsetting smaller cut components (combined with compound matrices and placed with *kentōban* and chases), into increasingly larger graphic depiction and printing areas. *Meander* (**Fig 3:12a**) and *Meander Magna* (**Fig 3:12b**) were designed using *kentōban* and compound matrices as drawing tools. The motif has been replicated, reversed and extended by direct transfer and offset printing. For *Meander Grander*, it was magnified digitally and configured for specific reconciliation with the circular chases (**Fig 3:12c**, **Fig 4:8c**p.112).

The working drawing for the final *Meander Macro* combination tint block and compound matrices was vector lines planning the laser cut-through of 6mm acetal resin (**Fig 3:12d**). The examples demonstrate how devising interrelated printing surfaces involving transfer and offset operations has moved the role of printing to an inaugural stage of the relief engraving process. Further integration: of drawing, printing surfaces and printing, together with printing apparatus is examined in Chapter 4 Printing: *Kentōban*, Chases and Furniture.

Kentōban, Chases and Furniture

The simplicity of the relief printing process and the earliest stratagems developed to print movable type are relevant to the development of the Modular System. Without actually utilising type, the Modular System relies on letterpress accoutrements, which co-function with both Japanese *kentōban* and spacing devices which are unrelated to type.

The problems that Pi Shêng and Wang Chen overcame with their movable type inventions introduced in Chapter 2 were so universal that descriptions of their solutions can serve to introduce chases, quads and quoins – letterpress accoutrements developed with the platen press and adapted to the Modular System. Along with *kentōban*, the role of anything in the press bed that is not a printing surface is for fixing, placing and registration, and could broadly be described as furniture.[1]

As the Modular System has been developed as an instrument for printmaking, simple straightforward technology assists the main purpose, but printing furniture has gradually assumed a more creative role than simply placing and registration. The bed of the press shows the mixture of *kentōban*-based technology and letterpress adaptations (**Fig 4:2** p.92). Their various functions are explained by their inventors, but the basic simplicity of relief printing rendered their early applications almost invisible – as can be seen in the earliest reports and instances of printing. They range from an apparent unawareness of the existence of such a process, through secret and clandestine innovation, to details of the apparatus of relief printing text by hand which are identical in purpose (and often in function) to those used with a platen press. In the case of the earliest extant relief printing, contemporary records of the million charms that were

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[1] *Forme,* type matter or type and blocks with its accompanying spacing material secured in the frame called a chase. '
'*Furniture*, material used in making margins, etc., for a printed sheet, also for filling up the space left in a chase after the type matter has been inserted.' (1962). A Dictionary of Printing Terms. London, Linotype and Machinery Ltd. pp.17, 18.

distributed throughout Japan on the order of the Empress Shotoku (AD c.764–70) do not include the innovative manner used to facilitate the scale of the repetition: there is no reference to 'printing'.[2]

A prolific counterfeiting industry, undeterred by the threat of beheading which was continually printed on the paper money in China from 1024 to 1380, included a colour and multiple block woodcut forger whose subterfuge forms an early report on colour relief printing methodology.[3] By tracing onto wood from a twelfth-century note that was printed from a brass or copper plate, Chian Hui the counterfeiter gives an example of imitation furthering printing invention along with early evidence of configuring an image onto a block for printing –- and establishes a precedent for one form of printing imitating another printing medium. Chu Hsi (1130–1200) recollected that in 1182–3

> a professional woodblock cutter, Chian Hui, ... repeatedly counterfeited paper money. He was quoted as saying that he cut a block of pear wood from a traced master copy of the *hui tzu* note for one string of cash. The imitation note, including a picture of a legendary figure, was printed with serial character and number in blue and seals in red on special paper made in the countryside of Wu-chou (in Chekiang). It took him ten days to complete the cutting. In a six-month period, in 1183, some 2600 sheets were printed on about twenty occasions, 100 to 200 sheets at a time.[4]

In selecting pear wood, preparing a block for printing by transferring the image from a tracing, cutting the block, declaring the print run, and naming the size of the edition, Chian Hui the counterfeiter must be one of the earliest reported instances of both a colour

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[2] The charms were distributed to Buddhist monasteries throughout Japan to fulfil a vow. Housed in wooden pagodas, the charms were printed on paper from relief blocks, possibly copper 'cast probably from clay models' and depicted Sanskrit text transposed into Chinese characters. Twitchett, D. C. (1983). Printing and Publishing in Medieval China. London, Wynkyn de Worde, Society pp.13–14.
Tsuen explains that four different versions of Sanskrit were transliterated into Chinese characters, and that printing was used 'is a conclusive fact', but no contemporary records refer to printing. Tsuen-Hsuin, T. and J. Needham (1983). Science and Civilisation in China Vol V:1, Cambridge University Press. p.337.

[3] The warning that forgers would be beheaded, together with an offer of a reward to informers, was written on all note issues 1024 – 1380. The only change was the value of the reward to informers and the script used (later was in Mongolian). Glahn, R. V. (2005). The Origins of Paper Money in China. The Origins of Value:the Financial Innovations that Created Modern Capital Markets
W. N. Goetzmann and K. G. Rouwenhorst. Oxford; New York, Oxford University Press**:** 65 - 91. pp. 74, 84.

[4] p.99 Tsuen-Hsuin, T. and J. Needham (1983). Science and Civilisation in China Vol V:1, Cambridge University Press.

printer and a block cutter. Glahn's recording of the same counterfeiter mentions an accomplice, thus making the activity into a workshop, and points out that the plates Chian Hui imitated were brass.

> We lack details for the design of the Southern Song *huizi* bills, but the deposition of a forger arrested in 1182 for carving woodblocks for counterfeit *huizi* offers some clues. The forger reported that he and his accomplice had cut six pear wood printing blocks, forged official signatures, and prepared designs with human figures and other scenes. The forger mentions an illustration of a particular narrative tale, but the caption is too vague to be positively identified. He made several hundred copies of one-*guan* notes, using red ink for the official seals, blue ink for the serial numbers, and black ink for the remainder of the design. Thus the design of the *huizi* bills seems to have corresponded to that of the *quanyin* used in Sichuan, most notably in the use of six separate impressions and three colours.[5]

The single mention of printing made by Marco Polo (1254–1324) also concerns Chinese paper money. When he observed the Kublai Khan's Grand Sire giving the final flourish to its printing in 1298, he appears unaware of the scale of the process he witnessed.[6]

> All these pieces of paper are issued with as much solemnity and authority as if they were of pure gold or silver; and on every piece a variety of officials, whose duty it is, have to write their names, and to put their seals. And when all is prepared duly, the chief officer deputed by the Kaan smears the Seal entrusted to him with vermillion, and impresses it on the paper so that the form of the Seal remains printed upon it in red; the Money is then authentic. Anyone forging it would be punished with death.[7]

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[5] 'Although the *huizi* forger used wooden blocks, genuine Song bills were printed using brass plates.' Glahn, R. V. (2005). The Origins of Paper Money in China. The Origins of Value:the Financial Innovations that Created Modern Capital Markets
W. N. Goetzmann and K. G. Rouwenhorst. Oxford; New York, Oxford University Press**:** 65 - 91. p.76.

[6] 'It is a strange fact that Marco Polo's detailed description of China does not mention printing, except in the passage … on paper money.' 'Paper money was the first form of Chinese printing met with by European travellers, was independently discussed by at least eight pre-Renaissance European writers, and so far as we know, is the only form of Chinese printing described in European writings of pre-Gutenberg days.' '...during the four centuries before Gutenberg a form of printing was going on that issued …literally billions, of notes, and scattered them to every hamlet in China...' Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. pp.109, 111–161,

[7] Carter quotes from the Yule annotated version of The Travels of Marco Polo (1903). Marco Polo's mercantile occupation made him a lively observer of commerce and he devoted chapters to paper money and paper making. Carter quotes on p.44 'The people are idolators and subject of the Great Kaan, and have paper money' as Marco Polo's habitual description of every Chinese city he encountered. Ibid. p.109.

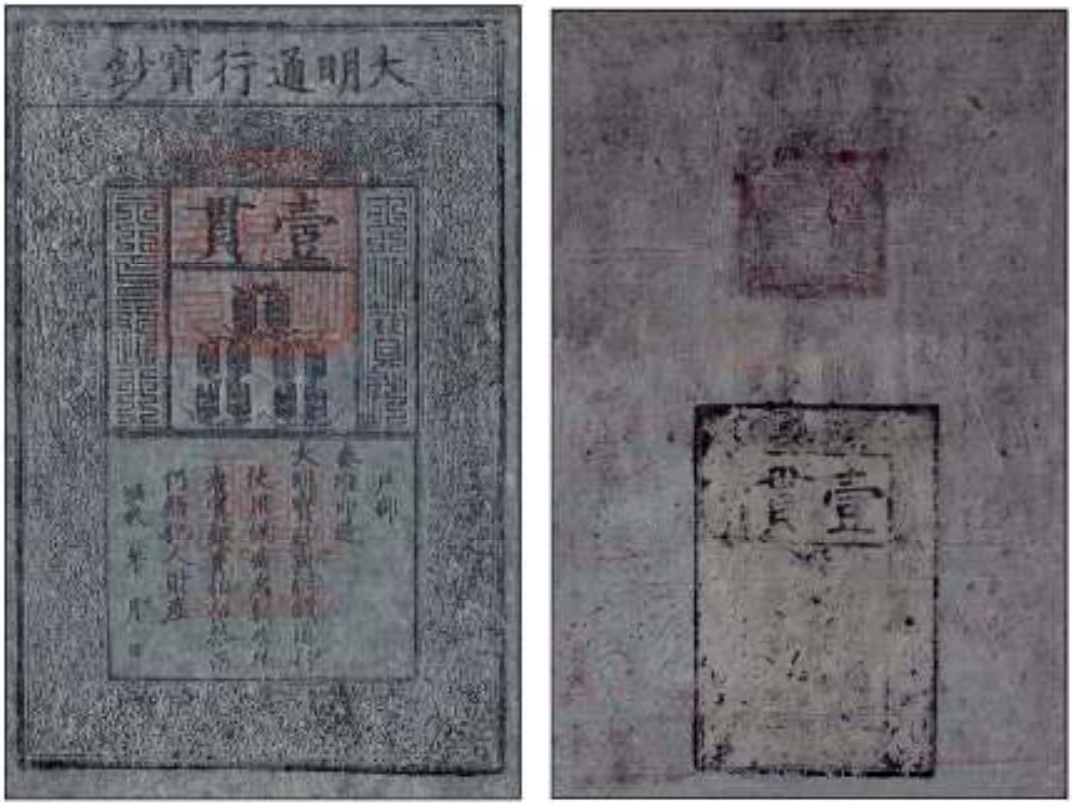

Fig 4:1 Chinese paper money: A Mogul (1024–1368) 1 *Kuan* note: obverse and reverse.

Relief printed paper money had already evolved from its inception in AD 994 through multiple colour printings and complicated lineal patterns (as in **Fig 2:4** p.34).[8] In his unwitting description of an early colour relief printer applying a red overprint to a note similar to **Fig 4:1** (p.95), and who would probably never have described himself as such, Marco Polo may have failed to discern the subtle difference between brush-drawn and woodcut-printed Chinese characters. Master-cutters cut *around* the Chinese characters brush-drawn onto woodblocks by calligraphers, whose individual styles were identified in the printed text.[9] Although the money plates were metal, **Fig 4:1** demonstrates that they retained these characteristics. The blocks were inked with the same water-based ink as for writing and were printed by brush burnishing. The making of movable type did not change the involvement of calligraphers, who made the same brush-drawn characters

[8] Ibid. p.104
[9] Ibid.p.83

with a brush, carbon water-based ink, and an unchanged hand brush-printing process.[10]

Printing by hand in the manner described by Marco Polo can only impart enough pressure for a small stamp. Carter (1955) relates the evolution from the downward-pressed seal to the printing of larger woodblocks face-up, and Hind (1935) refers to hand printing with the aid of a mallet remaining an expedient for printing textiles in fifteenth-century Europe.[11] The European development of relief printing text with a press was gradual, but the use of oil-based ink that necessitated thicker paper and also printing on vellum were suited to printing with the greater pressure obtainable from a press. An indication of the basic simplicity of the relief press is Parshall and Landau's (1994) speculation that the book-binder's press and 'the average linen press employed in any well-outfitted middle-class household' might have been a model or a substitute for early platen presses.[12] The *letterpress* printing systems which took the platen press into the industrial age as the vehicle for movable type made no mechanical adaptation but supplied removable components: formes, chases, quoins and quadrants. Additionally, text printing largely exploited the efficacy of carbon or lamp black ink.

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[10] '...Once the type is set, the process seems not to differ materially from that of block printing.' Carter quotes an 1857 source witnessing identical methodology as pre-European influence the process remained unchanging. Ibid. p.221. See also Wang Chen's description of making wooden movable type in Chapter 4. Rudolphe (1954) witnessed the process surviving in 1948. Rudolph, R. C. and C. Chien (1954). A Chinese Printing Manual. Los Angeles, Printed by The Ward Ritchie Press for members of the Zamorano Club. p.xi.

[11] Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. p.39-43

'What appears to be the earliest of (hand printing methods) these followed the common method of printers of pattern blocks on textiles, printing by stamping. The woodcutter would lay his paper on a hard board, and then press, stamp or hammer his inked block face downwards on to the paper. Lippman called this *press-druck* in contrast with press *pressendruck*: the method of printing with the press.' (Lippman: *Print Collectors Quarterly* XV 131 April 1928) Hind, A. M. (1935). An Introduction to a History of Woodcut: with a Detailed Survey of Work Done in the Fifteenth Century, Dover reprint. p.3.

[12] Landau, D. and P. Parshall (1994). The Renaissance Print: 1470-1550. New Haven; London, Yale University Press. p.29.

The importance of both hand and press methods of printing to the project is this enduring simplicity. While hand coloured relief printing is as old as the process, the inclusion of printed colour with its requirement for registration continued to engender innovation. [13]

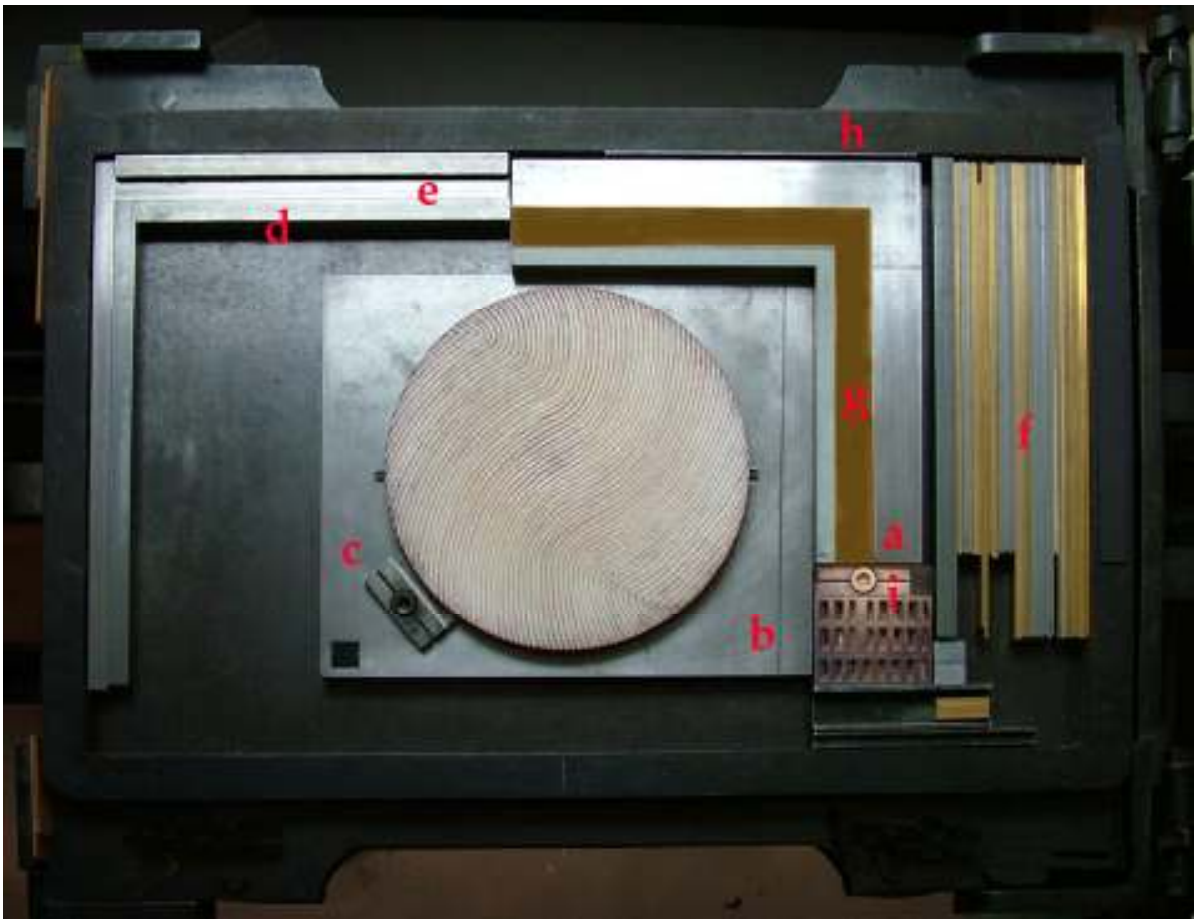

Fig 4:2 Platen press bed with furniture for the Modular System:
a) steel *kentōban*, **b**) circular chase with *Large Round 29* Linear Tone Block, **c**) quoin and spacing for locking circular chase blocks, **d**) 12mm *kentōban*, **e**) steel 12mm spacers, **f**) brass 2mm, 4mm and steel 5mm spacers, **g**) magnetic *kentōban* adhered to main steel *kentōban* delineates paper margin. **h**) The main chase covering the entire bed locks the steel *kentōban* in place, **i**) quoin locking steel *kentōban* with em quadrants.

[13] Few of the surviving examples of early European woodcuts are *not* coloured according to Field, who states that 'Two early characteristics often overlooked are the presence of colour and absence of text.' They are 'images pure and simple, neither inscribed by hand nor with printed legends.' He concludes that 'It is reasonable to conclude that color was an expected component of the woodcut from the outset.' Field, R. S. (2005). Early Woodcuts, the Known and the Unknown. Origins of European printmaking : fifteenth-century woodcuts and their public. S. Parshall P, R. Washington, National Gallery of Art, in association with Yale University Press, New Haven**:** 19-35. p.20.

The platen press remains relatively uncomplicated, lending itself to a central role in a system where it is important to reduce technicalities to make way for creative development. In addition to dictating the template size, the action of the platen press has informed processes developed in the system. However, a primary advantage of the platen press exploited in the project is that it can be used in conjunction with hand printing methodology.

The Platen Press Bed (**Fig 4:2** p.97)

The Albion platen press bed used for the development of the Modular System indicates the mixture of hand registration devices and letterpress accoutrements that have become vehicles for creative development (**Figs 4:2a** to **4:2i** p.97). The furniture is permanently placed for quick retrieval and shows that *Klunk* – the original steel *kentōban* – is still doing its basic duty (**Fig 4:2a**). A circular chase placed into the steel *kentōban* corner ready to print, demonstrates that precise registration devices are removable and they are also reversible (**Fig 4:2b**). The large circular tint block no 29 is locked into the chase with a quoin and can be upturned to offset print (**Fig 2:4c**). The narrowest removable secondary *kentōban* (**Fig 4:2d**), is a right angle of 12mm steel and specifically centres the largest tint block (**Fig 4:4a**). Brass marquetry strip and steel section in millimetre increments play the same role as letterpress em and en quadrants in the Modular System: they space and determine margins and are stored for easy retrieval (**Fig 4:2f**). Paper margins are determined on the steel *kentōban* but whereas previously they were layered from masking tape (as in **Fig 1:11** p.17), they have been replaced by magnetic matting which adheres to the steel and effects a faster change of margin and paper size (**Fig 4:2g**). The whole *forme* is bounded by a chase that covers the entire press bed (**Fig 4:2h**), and positions all printing surfaces in a central position under the platen for printing, but only the original steel *kentōban* is locked in, by a set of letterpress quadrants and a quoin (**Fig 4:2i**). The use of *furniture* in the project describes everything in the press bed inside the main chase, used to fix or place the printing surfaces. Their roles can be explained by their inventors.

Chases, Quoins and Quadrants

The purpose and function of the European letterpress chases and quoins adapted in the modular system are identical to early Chinese strategies invented by Pi Shêng (c. 1041–48) and Wang Chên (1290–1333) for placing and fixing their movable type. In the Chi'ing-li period (1041–48) Pi Shêng

> …had previously prepared an iron plate and he had covered this plate with a mixture of pine resin, wax and paper ashes. When he wished to print, he took an iron frame, and set it on the iron plate. In this he placed the type, set close together. When the frame was full, the whole made one solid block of type. He then placed it near the fire to warm it. When the paste [at the back] was slightly melted, he took a smooth board and pressed it over the surface…[14]

The 'iron frame' conforms to Moxon's 1683 description of a letterpress chase:

> A *Chase* is an Iron Frame ... all its sides must stand exactly square to each other ... it must lie exactly flat. ... The outside and inside must be Filed straight and smooth.[15]

Pi Shêng's resinous wax solution has an identical function to Wang Chên's 1311 bamboo strips and wedges to fix his wooden characters into a frame which also closely resembles a chase.

> A compositor's form is made of wood, strips of bamboo are used to mark the lines … Then the type are placed in the columns [of the form] and bamboo strips which have been prepared are pressed between them. After the type have all been set in the form, the spaces are filled in with wooden plugs, so that the type is perfectly firm and will not move.[16]

Moxon (1683) describes '*Quoyns*' as exerting the same lateral pressure. 'The office of the

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[14] Carter's translation of Shên Kua (1031–95) appears to be definitive and is used by Tsuen 1983. Carter has compared various editions of the text, which was has been slightly modified by Goodrich (1955) from f/n 13p.220 ' in order to conform to the revision made by Dr. Hu Shih ... with his permission). Carter describes Shên Kua as being 'regarded as one of the most accurate of the Sung writers' – and if the implication from the oldest edition is assumed correct, he was a personally acquainted with Pi Shêng – and he had inherited the type. Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. pp. 211–13.

[15] Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications. p.43.

[16] Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. p.216.

quoynes are to *Lock* up the *Form viz.* to wedge it … close together.'[17] The quoins (**Fig 4:2c, 4:2i** p.97) use the same lateral pressure as in Wang Chên's and Moxon's descriptions and their function was particularly suited to their integration with the circular chases designed in the project (**Fig 4:7** p.109).

The bamboo strips that Wang Chên used in his wooden chase play the part of quadrants and of the spacers used in Modular System, where quadrants were specifically rejected. Unlike the rest of the furniture, the minor role of these letterpress devices seen in **Fig 4:2i (**p.97) did not evolve: they have been an endless source of frustration over my long use of the platen press. Quadrants are ubiquitous, accurately square and the correct height for use with relief blocks – but their widths, in en and em increments for their use with type, have constantly proved incompatible with graphic work not connected to letterpress printing.[18] A metric system was adopted and the brass and steel strips in millimetre increments were accumulated from various sources and augmented by magnetic strips of one or half a millimetre, which can be stuck onto steel spacers or *kentōban* (**Fig 6:15** p.165)**.**

Wang Chên emphasised the importance of standardizing his type after carving the characters on a single planed block:

> The block is then cut in squares with a small fine saw till each character forms a separate piece. These separate characters are then finished off with a knife on all four sides, and compared and tested till they are exactly the same height and size.[19]

The requirement for standard block sizes is compounded by the use of colour or multiple blocks that are used for overprinting in addition to being ganged up with spacers. The simplicity and the mobility of some letterpress equipment designed to place printed text

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[17] p.37 Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications.

[18] '*Quadrant*, a piece of metal lower than type used for spacing; usual sizes en, em, 2, 3, and 4 ems.' (1962). A Dictionary of Printing Terms. London, Linotype and Machinery Ltd. p.35.

[19] Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. p.214.

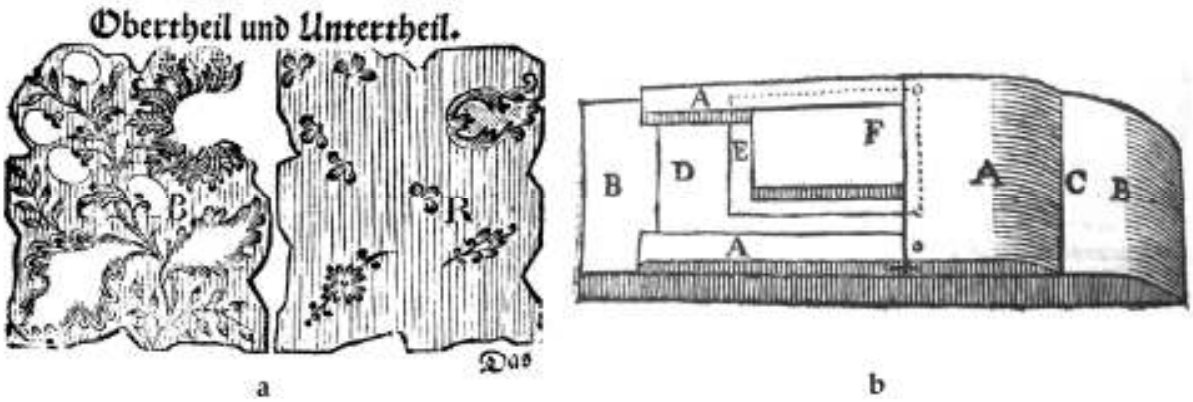

Fig 4:3 Registration invention:
a) Funcke's 1740 plates probably resemble the compound solution of Fust and Schoeffer, **b**) Papillon's 1766 registration box for printing relief with an intaglio press modelled on one used by Le Sueur.

on a page is ideal for accurate multiple printing. However, the pin system adopted early for letterpress registration used by Edmund Evans lacks the simplicity and directness of the Japanese solution (**Fig 2:11d** p.49).[20] The *kentōban* system appeals for the manipulation of multiple blocks in order to print a single graphic image using the platen press without type. Retained for this purpose at the outset, further *kentōban* devised for the Modular System assumed a more versatile role (**Fig 4:4** p.103). Colour printing particularly engendered inventive registration devices in order to place successive blocks accurately over an existing printed image. However multiple block prints are not necessarily used for colour. At the outset of letterpress printing, from 1475, Fust and Schoeffer employed compound plates for the illuminated letters of their liturgical works printed with movable type. By avoiding multiple printings, they solved two problems associated with colour printing. They circumvented the difficulty of accurately re-damping paper in unheated workshops by simultaneously printing two colours as the compound plates had integral registration. Once the outer receptor plate was positioned, the movable part, as in Funcke's 1740 plates was registered and printed in one pass (**Fig 4:3a** p.101).[21]

[20] Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications. p.266.
[21] Funcke, J. M., J. Mosley, et al. (1740,1998). Kurtze Anleitung von Form-und Stahlschneiden. Darmstadt, Lehrdruckerei der Technischen University of Darmstadt.

Papillon (1698–1776) claimed that

> The best and the most certain, as well as the most convenient and ready manner, for printing the large blocks of a Cameo, or, indeed, of the small ones, is to employ the rolling press, that is used by the copperplate printers, and a chase invented … by N Le Sueur.[22]

and described his use of it in detail with a wood engraved illustration (**Fig 4:3b**).[23] It can be seen from Funcke's plates in that registration is an integral part of compound printing surfaces (**Fig 4:3a**). This capability of the compound matrices to act as registration tools has contributed to the blurring of the boundaries between furniture and printing surfaces which has occurred during the evolution of the Modular System.

The development of holding compounds from the compound matrices exemplifies how registration innovation has furthered the graphic capabilities of the Modular System. The holding compounds are essentially compound matrices, replicated in thinner material, to register components removed from the compound matrices for separate printing. They facilitate simultaneous printing of paired prints such as *Good Gum Green Left and Right* (**Fig 1:13** p.23). A *Trends* linoleum compound matrix is shown replicated for a *Trends* holding compound with two layers of polypropylene, by tracing through the translucent material with a stylus (**Fig 4:4b & c** p.103). The use of maculature is explained in Chapter 5, with the deployment of *Tables* holding compound with *Tables* compound matrices (**Fig 5:14** p.140).

The utilisation of vinyl has instigated further registration invention for Holding Compounds that is influencing both the graphic outcome and future potential of the Modular System. Alternative stratagems were necessary to preserve the dual printing sides of vinyl and the solution was found in magnetic matting. The green and blue vinyl

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[22] Translation from: Papillon, J. B. M. (1822). Practical Hints on Decorative Printing. London, William Savage**:** 91- 98. p.93.

[23] Illustration photographed from: Papillon, J. B. M. (1766). Traité Historique et Pratique de la Gravure en Bois. (Supplément ... Tome Troisième.). Paris. p.368.

Fig 4:4 Modular System Registration:
a) Coordination of *kentōban,* circular chases and tint blocks
b) *Trends* linoleum replicated in Gerprint for a holding compound to register removable components.
c) Vinyl with magnetic matting used to hold components of *Curly Journey*.

sides of *Curly Journey*, are juxtaposed with dark brown magnetic matting (**Fig 4:4c** p.103). By gripping a steel underlay, the matting conserves both sides of the vinyl as printing surfaces. As an entire replica of the *Curly Journey* Compound Matrix was replicated in magnetic matting, either the central snake or the main body can be made ready for receiving offsets from tint blocks. The holding strength of magnetic matting has facilitated a new format of the main compound matrices. It can be seen that the *Curly Journey* compound matrix is completely separated into three jigsaw pieces. This further development, into more fluid and spontaneous placing and registration options, draws a parallel with the resinous wax solution of Pi Shêng, which also resembles the twelfth-century Chinese *douban* registration system. *Douban* translates as 'assembled blocks printing' and can be used for 'small independent areas of large blocks.'[24]

The role of magnetic matting in the Modular System is further evolving due to its flexible surface, which can be incised with woodcut hollow tools. It is thus poised to become a tertiary flexible printing surface: conveying graphic information to tint blocks and receiving offset prints from tint blocks in the manner of vinyl and linoleum. Thus the inclusion of magnetic matting as a registration device is further blurring the boundaries between press furniture and printing surfaces. As the material employed originates with the contemporary sign-printing industry and is used to print a removable stencilled signage for motor vehicles, magnetic matting joins acetal resin and vinyl as a further example of how innovative uses of materials can direct graphic invention.[25]

kentōban (**Fig 4:4a** p.103)

The use of the term *kentōban* in the thesis is derived from Salter, who appends a clear illustration to her description: as a stand-alone registration corner useful for multiple blocks and for images with no margin for an intrinsic *kentō* or 'registration marks carved

[24] Barker cites the bookseller Hu Zhengyan as inventor of the *douban* and its use in *The Ten Bamboo Studio Manual of Calligraphy and Painting* 1129 Barker, D. (2005). Traditional Techniques in Contemporary Chinese Printmaking. London, A & C Black. pp 7–18.

[25] I am grateful to my supplier, Intaglio Printmaker London, for revealing the source of their stock.

on the block'.[26] Although the earliest extant Japanese *kentō* appear in colour printed illustrations in a third edition of the Sennyō-reki (1644), according to Brown (1988) 'it was the *Ukiyo-e* artist Suzuki Harunobu (1724–70) who first exploited this new medium.'[27] In addition to making perfect registration, the *kentō* made colour printing economically profitable. By the early seventeenth century the Chinese colour prints and books including *The Mustard Seed Garden Manual* and *The Albums of the Ten Bamboo Studio* had reached Japan.[28] David Barker's observation that the Japanese character for *kentō* has a Chinese origin may be evidence of the concept of registration emanating from China.[29]

Kentōban in the Modular System have been devised to co-function with the circular chases (**Fig 4:4a** p.103). Each of the tint blocks can be centred to the template size with a specific *kentōban* which nestles into the fixed original steel *kentōban* as the circular chase in **Fig 4:2b** (p.98) shows. As in the Japanese model, the right-angled steel is only part of the registration system. In addition to the procedure established for acetal resin blocks (**Fig 1:11b** p.17), a mark identifies all the linoleum and vinyl components and all proofing and editioning paper substrates used with the Modular System (**Fig 4:5** p.106). The marks also demonstrate that the characteristics of the various materials necessitate different treatments. Identifying the registration corner on everything has become essential for efficient planning and printing using the Modular System and is an indication of the degree to which printing has been integrated into all aspects of making prints. In addition to establishing the correct orientation of blocks and paper for overprinting, the mark addresses the potential confusion caused by proofs from offsets

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[26] Salter appends only *kentō* in her glossary. Salter, R. (2001). Japanese Woodblock Printing. London, A. & C. Black. pp.18, 123.

[27] Brown, Y.-Y. (1988). Japanese Book Illustration. London; Wolfboro, N.H., British Library. p.20

[28] The first editions of the *Sennyō-reki* had been printed with black and white and the book continued to be printed in this way. Of the 7 volumes of *Sennyō-reki* (1644) '2 pages in Vol. 4 are printed in black, red and blue. The register marks are clearly visible on these last two pages and there is no doubt that the colour is printed.' p.289 'Two of the colour diagrams in the Sennyō-reki show clear register marks, proving that the kento was known in Japan in the seventeenth century. 'It is of course, possible that it was re-invented independently by Utamaro' pp.19–20.Waterhouse, D. B. and A. British Museum. Dept. of Oriental (1964). Harunobu and His Age; the Development of Colour Printing in Japan. London, Trustees of the British Museum. pp. 18–20, 289.

[29] Personal communication 2006.

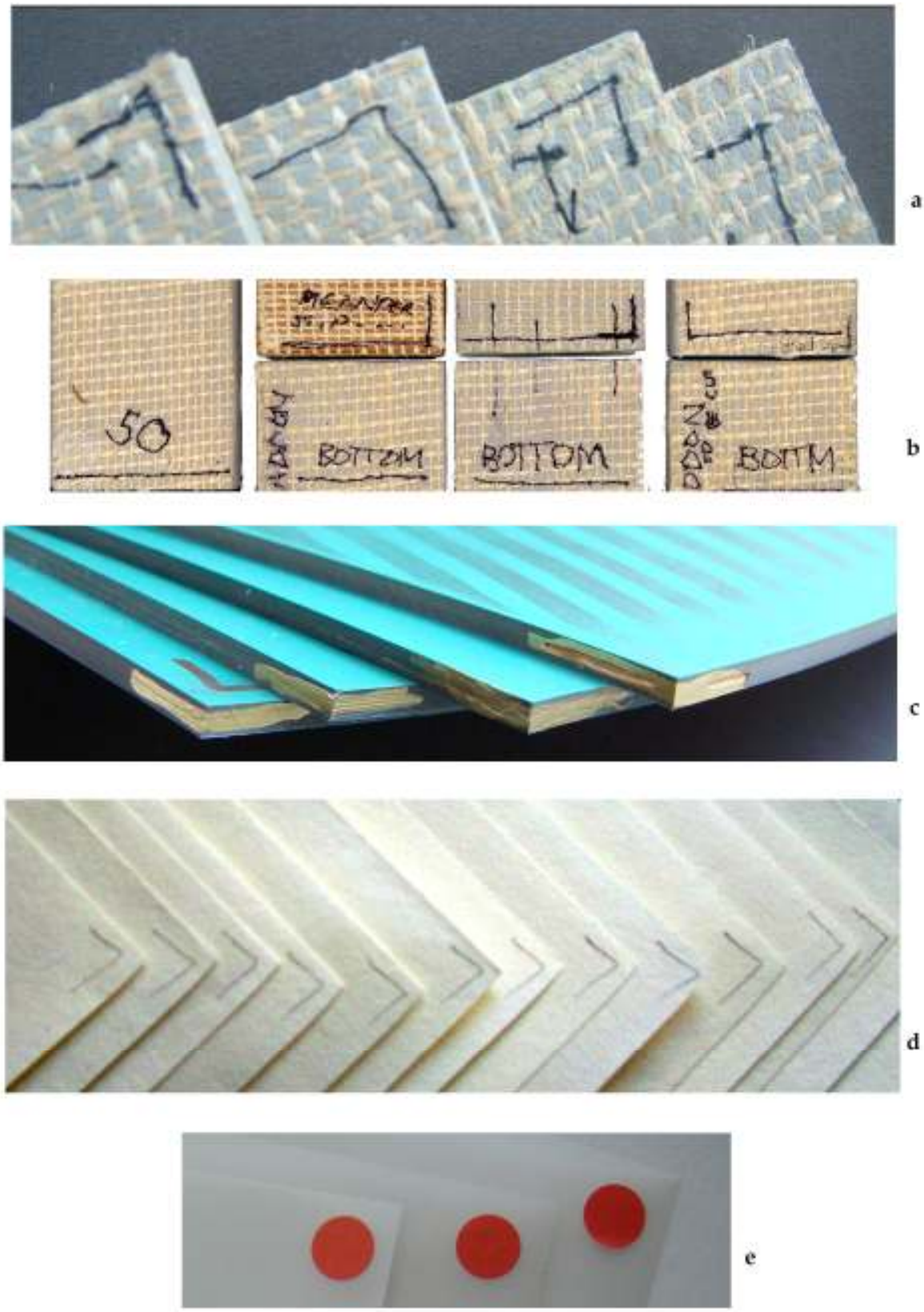

Fig 4:5 Registration marks: **a**) linoleum, **b**) linoleum components are marked on bottom corner, **c**) vinyl on corner edge, **d**) all editioning paper has the back marked, **e**) tracing paper proofs are marked with a coloured spot to easily distinguish printing or printed side when planning prints from proofs.

Fig 4:6 *Kentōban* devised for the Modular System at Stage IV

in different orientations. Linoleum, proofs and printing paper are marked on the back with a small 90° angle, (**Figs 4:5a, 4:5c** p.106). Smaller linoleum components are marked at the base and at joints (**Fig 4:5b**), but double-sided vinyl necessitates a thin paint-mark on *kentōban* corners (**Fig 4:4c**). For the practice of planning prints from tracing paper proofs which has been developed with the Modular System, a red spot is fixed to the back of the *kentōban* corner (**Fig 4:5e**). The underside of the spot is easily identified as *print* orientation, while the red showing is *block* orientation. This has recently extended to matching a green or blue spot to the colour of the printed side of vinyl – an expedient which further reduces confusion and aids planning.

Construction of a series of *kentōban* The initial purpose in devising additional *kentōban* in the project was to facilitate accurate overprinting of larger linoleums with tint blocks by setting them into the original steel *kentōban.* They developed a dual purpose by enabling accurate and repeatable offsetting positions onto the flexible substrates of full template-sized linoleums and the compound matrices. The original set of *kentōban* designed in the early stages of the research is shown at **Fig 4:6** (p.107).

The *kentōban* further evolved during the project into placing and measuring devices that assist with the preliminary drawing and planning of prints and they instigated the design of the circular chases. The modularity of the system depends on being able to change and move tint blocks about the flexible printing substrates, which the *kentōban* facilitates.

A squared tint block is easily turned through 90° in a *kentōban*, as for *Pole Apart Left*, but any other angle is not feasible (**Fig 1:13** p.23).[30] Furthermore, the simple right angle proved inadequate to hold circular tint blocks accurately for transfer printing. During this process, the circular base gave no clue to the angle of rotation. A reversed protractor overlay, with side markings on the blocks, only marginally limited the complication. The necessity to replace the hidden angle accurately by hand and to calculate the required reversed increment of 360° typifies the distracting calculations that the Modular System has primarily been set up to avoid. Technical decisions are often taken to minimise further technical distraction: the construction of the narrowest *kentōban* is an example (**Fig 4:4a** p.103).[31] The largest tint blocks could be placed accurately by placing two 12mm steel sections which live in the press bed – but having a ready right angle halves an operation which occurs in the middle of printing two offsets, one on thin linoleum with a thick base and the next on a type-high block requiring the 12mm margin.

The Circular Chases (**Fig 4:7** p.109)

Changing and fixing the angles of the round tint blocks was solved by designing devices that were derived from letterpress practices. The design and development of the circular chases exemplify the way that Modular System developments continue to open up further potential than anticipated. The precedent for the circular chases came from a single example, rescued from printer's scrap and adapted by printer and print historian Graham Williams (**Fig 4:7a** p.109). The chase has no provenance and was a simple iron circle with two squared holes, evidently for quoins. The lateral pressure thus exerted presented a solution for holding and printing upturned circular blocks in a specific orientation. Williams devised wooden outer frame pieces which facilitated control of the angle of the locked-up block fitted into the iron circle. This suggested the idea of double rotation.

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[30] An attempt to configure a pair of skewed *kentōban* [*Skento*] failed. Making accurate right angles proved difficult, and the outcome was limited to a single angle: this encouraged the idea of rotation through 360º. Vinyl may furnish a successful solution as it is easy to cut accurately square and can be inset with almost no tolerance (as in **Fig 6:17** p.168).

[31] Made by Leon Rochat 2007, who made the original steel *kentōban* in 1986.

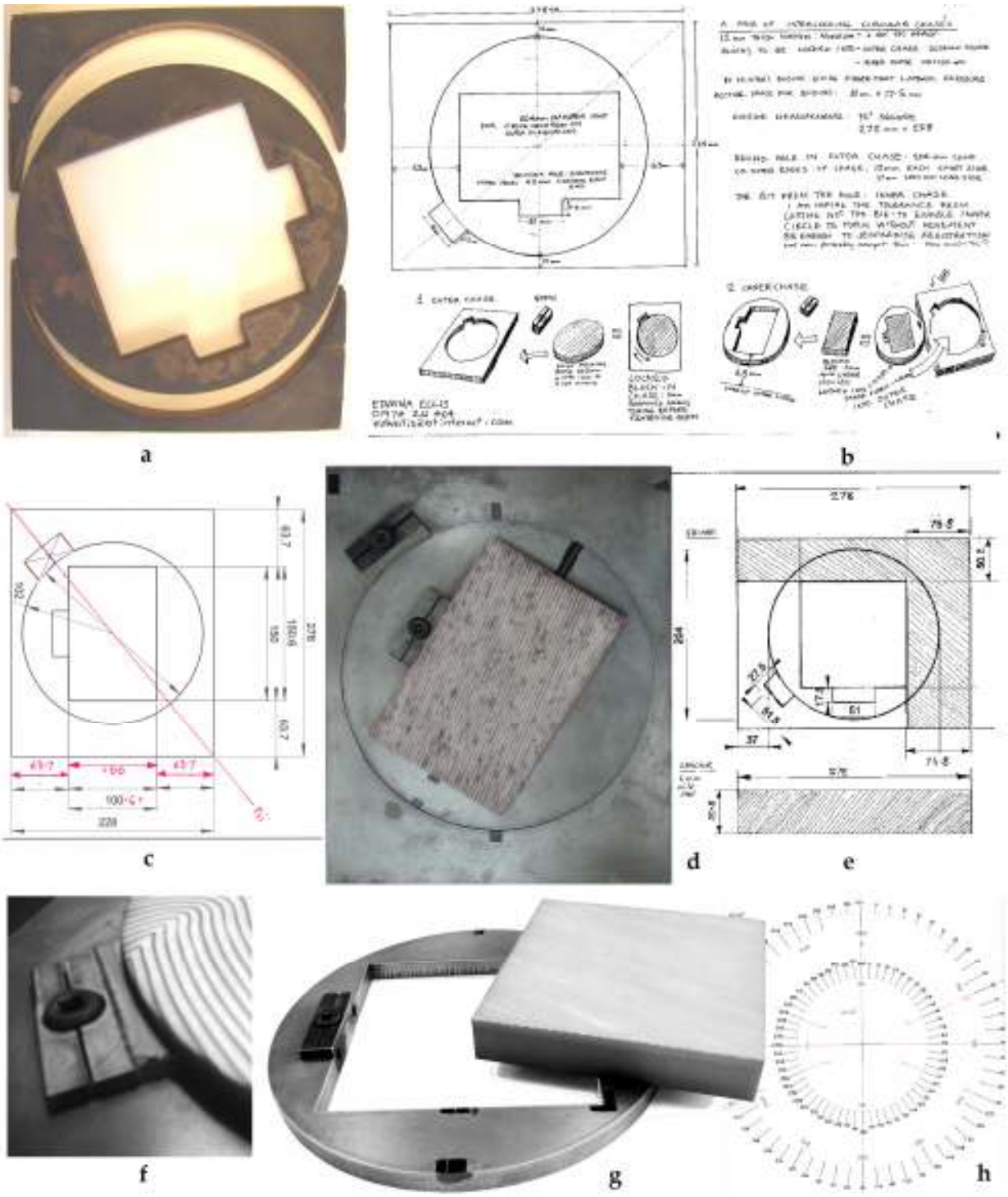

Fig 4:7 Development of circular chases: **a**) the single historical example, **b**) designs for a system of nesting chases, **c**) Annotated CAD drawings from engineers for chase with oblong inner, **d**) the pair of chases for oblong tint blocks and smaller 100mm circles. Larger circles are held in the outer chase alone (as **Fig 2:2e** p.27). **e**)Annotated CAD drawing showing chase compatibility with *kentōban*, **f**) quoins are used to hold the blocks with lateral pressure – with linoleum and polypropylene adapting spacers. **g**) The inner chase for holding square blocks with a laser engraved tint block, **h**) protractor scheme to determine angle of tilt. Protractor files are kept to A4 for ease of replication to supply moving-frame schemes.

Fig 4:7b (p.109) shows the original conceptual drawings for a pair of circular chases that could accommodate oblong and square tint blocks respectively in the inner ring, and a large circular tint block in the outer chase. The engineering firm who laser-cut the chases in 12mm mild steel converted the specifications to computer aided design (CAD) technology, sending actual-size pdf files for approval and amendment. **Fig 4:7c** and **Fig 4:7f** show print-outs of files with calculations to determine the correct size and also delineations for thinner steel *kentōban* that were designed to be compatible for placing purposes – and to act as a control for the chases (**Fig 4:7a**). These were cut from 6mm mild steel in order to register both type-high tint blocks and the thinner linoleum and vinyl.[32] They ensure interaction with both chases and the tint blocks, as (**Fig 4:4a** p.103).

The tolerance of the laser cut (0.3mm) was narrow enough to furnish movable parts that were cut from a single sheet of 12mm mild steel plate, by utilising the quoin space as entry for the laser beam.[33] Small spacers to reconcile the quoins to circular blocks were fabricated from linoleum and polypropylene sheet, but these devices could also be laser cut in future (**Fig 4:5f** p.106).

In addition to solving a dilemma that was growing with the steady production of tint blocks, the chases indicated a new direction for the development of imagery in the project. Rotating the tint blocks for overprinting in any direction could avoid the interference patterns which occur between two sets of parallel lines. However, the *Tabby* 29 animation was assembled from exploratory proofs which actively sought and exploited such an interference or *moiré*. Stills from the film (**Fig 4:8a** p.112) and the exploration culminated in the *Tabby Twenty Nines* variable print edition on paper (**Fig 2:8** p.41).

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[32] 6mm thick steel is feasible for use with both type-high 23.3mm acetal resin and linoleum and vinyl which at only 3-4mm, has extra underlay for use with steel *kentōban*. Sorb Engineering of Marlow Bucks UK cut the chases.

[33] The beam takes up a much larger area at entry – 5–6mm.

Drawing with furniture (**Fig 4:8** p.112)

The development of the *Large Linocuts* has been shown in Chapter 3 as an example of the increased involvement of printing and printing apparatus in the generation of both imagery and components for the Modular System. Preparatory graphics have been configured by printing, and working drawings often involve printed proofs. Printing on tracing paper has become routine with the specific purpose of holding a bank of proofs which can be layered together for planning future prints. The apparatus of printing – spacers, both the circular chases and the *kentōban* – is used as part of the preparatory work and paradoxically has enabled a more spontaneous approach to image generation for printmaking.

Fig 4:8 shows various ways that imagery is inaugurated for prints by involving printing apparatus and furniture. *Trends* was drawn directly onto the linoleum over delineated positions of tint blocks traced around both steel *kentōbans*: the lines are just visible (**Fig 4:7a**). This enabled the *Trends* compound matrix to be devised with the 'accidental' bits of offset from various blocks carefully planned. *Trends* typify the changing role of the original compound matrix in any planned series: it remains the basic matrix for all reversals and subsequent printing surfaces, but it is also becoming the working drawing.

The circular chase and spacers were similarly utilised for *Alberslines*, but the original plans were thumbnail sketches. They were drawn, using scale stencils of the tint blocks and chase positions cut from polypropylene (**Fig 4:7b**). *Alberslines* was digitally enlarged and oriented to match a square block tilted in the circular chase. Its final drawing, directly onto vinyl, was centred on the square, seen cross-hatched in *Alberslines Meshed Up* (**Fig 4:8b**). The *Alberslines* lines were configured parallel with two 5mm spacers. Drawing has also initiated plans for tint blocks. The drawing for *Meander Grander* was specifically determined by the position of the largest circular tint block position in the circular chases, but it also identified a niche and initiated the inclusion of 60mm and 100mm diameter circular tint blocks (**Fig 4:8c**).

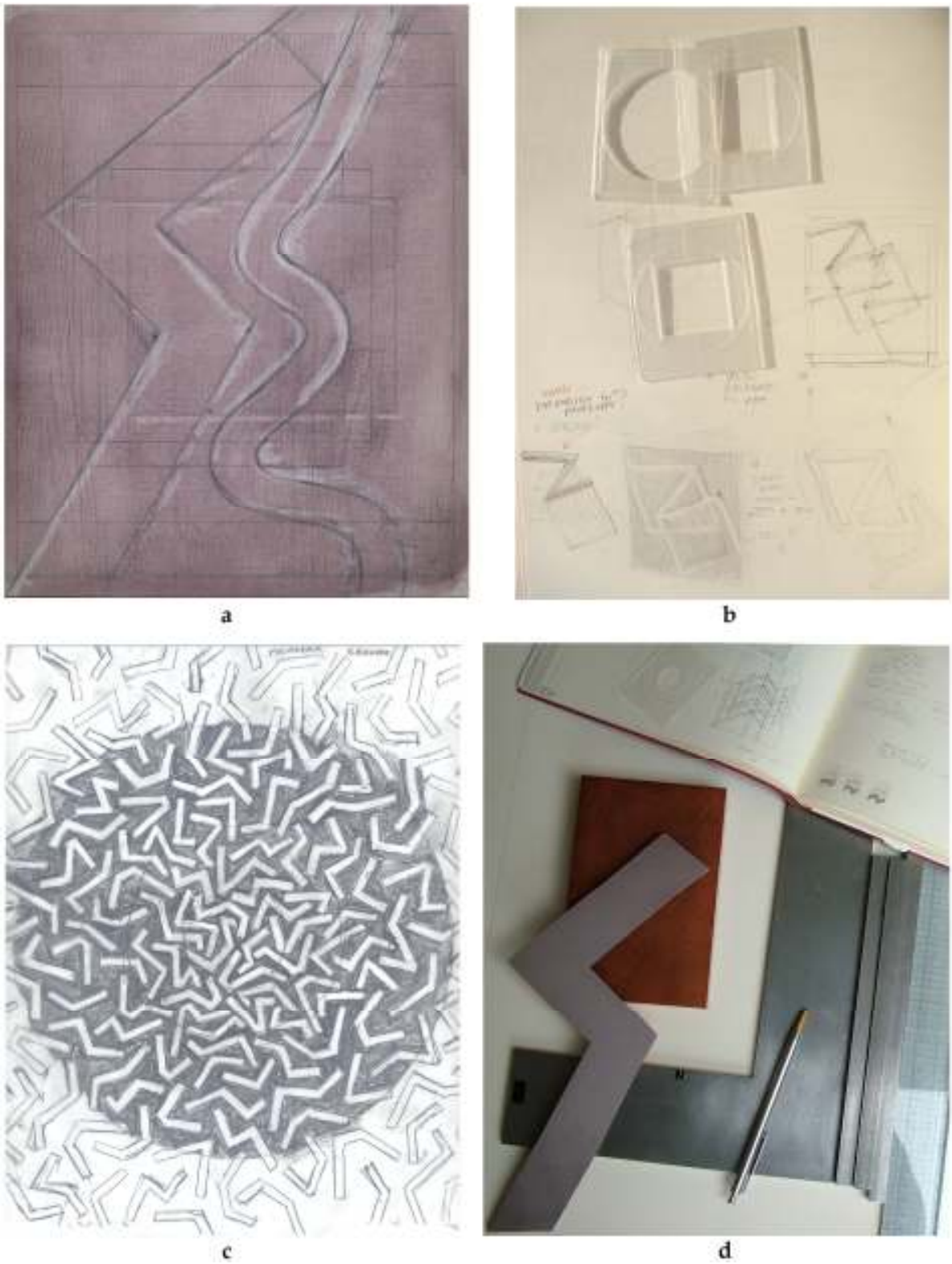

Fig 4:8 Drawing and planning and the integration of press furniture and printing surfaces: **a**) the initial drawing for *Trends* straight onto linoleum, **b**) planning *Alberslines* with scaled stencils of chases and blocks, **c**) reconciling *Meander Grander* with circular chase and position of largest circular tint block, **d**) planning *Zags* using *kentōban*, spacers, and a *Sharp Trend*.

The plan for the *Zags* series built on ideas generated from *Trends*. The *Sharp Trend* component linoleum joined a typical collection of spacers, *kentōban* and blocks on the drawing board (**Fig 4:8d** p.112). However, the gestation of *Zags* exemplifies how the nature of the journey taken with the Modular System encompasses both widening avenues and blind alleys. *Sharp Trend,* isolated from its compound matrix, resurrected imagery from decades of drawing and photographing red and white striped Indian temple steps, (**Fig 4:9b** p.114). These had been regularly sidelined by the more stringent demands of conventional engraving. By implementing maculature as a fading and repetition device, an enduringly inspirational graphic image can now be used with the Modular System. Tom Sowden at the Centre for Fine Print Research at the University of West England assisted in digitally copying and pasting a set of *Zags,* for laser cutting a set of vinyl compound matrices with *Zags* in varied positions. Laser cutting promised accuracy for repeatedly replacing a single inked *Zag* in a fading maculature run (as in the plans shown in **Fig 6:12** p.158). However, the laser beam cut a wide line which does not register accurately, and using a laser-beam on vinyl proved to be a dangerous and unrepeatable operation. Thus the *Zags* are temporarily on hold; but they demonstrate that one of the effects on working practice is the retrieval of ideas and inspirations that did not fit the more specialised parameters of conventional engraving.

Although drawing appears more technical, the printing furniture actually enables planning spontaneity and reduces technical complications. The little set of scale stencils live in a pencil case handy to a sketchbook. The spacers configured to replace quadrants have minimised technical drawing by furnishing instant parallel lines and accurate margins. Margin accuracy grows in importance and would be extremely time consuming

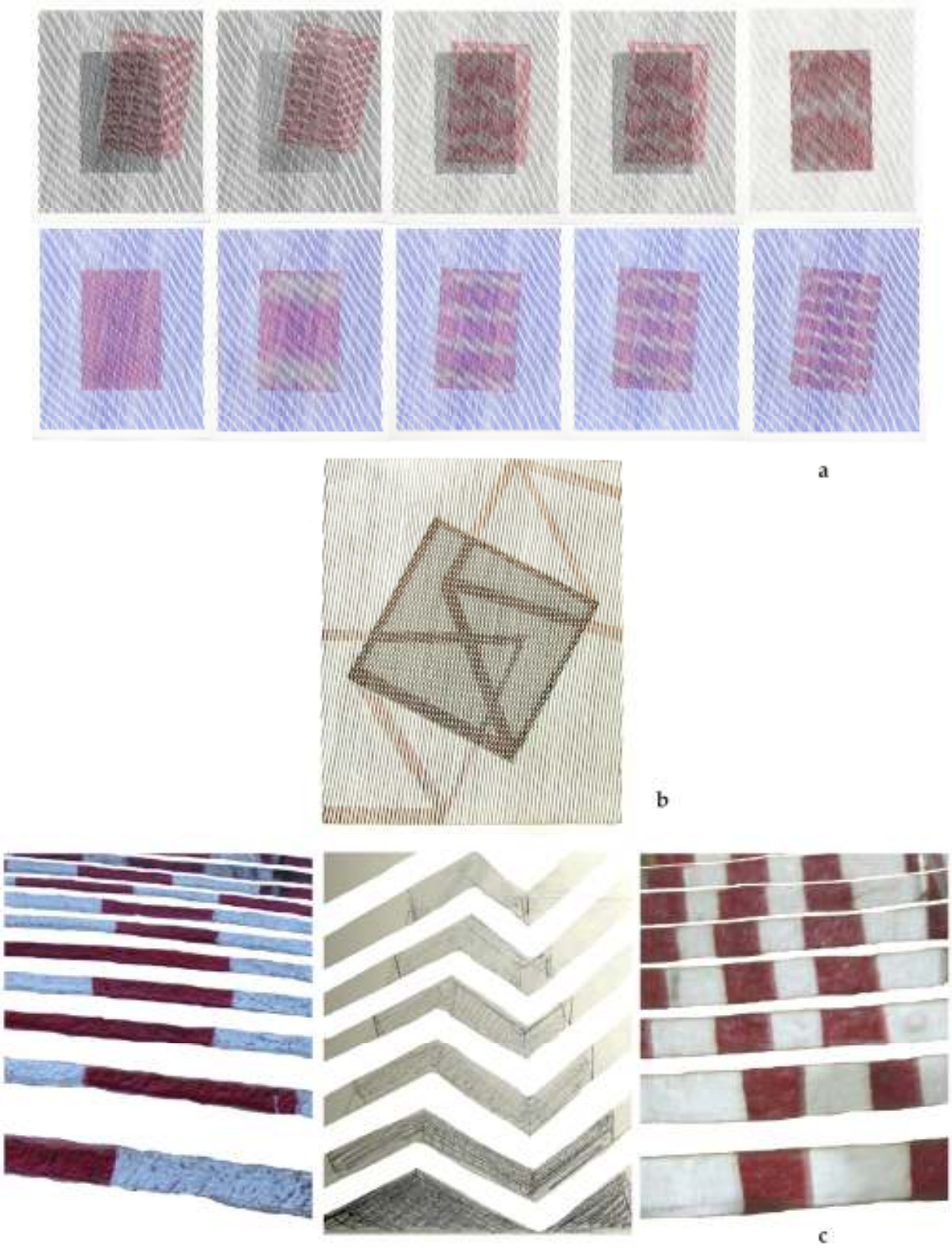

Fig 4:9 New directions from printing and drawing with furniture: **a**) Stills from *Tabby* animation series. **b**) *Alberslines Meshed Up* emphasises the central square configured by circular chase. **c**) Plans for *Zags* and maculature runs from Indian temple steps.

without the spacers. This is due to verso printing and de-bossing with the printed face up demanding the lateral accuracy of cut paper – literally two equidistant *kentōban* corners. In this instance, the spacing furniture has saved hours of febrile mathematical blundering. The involvement of furniture in drawing is an indication of the multiple roles of drawn lines. A dark line may not remain dark but become a highlight streak Consequently, the drawing starts a journey with a printed image that has a clouded destination. The work of Klee and Albers, formerly puzzling inspirations, now make sense at a different level: a line can indeed be taken for a walk – but with the Modular System, you do not tell it where it is going.

with Embossing, Offsetting and Maculature

Relief printing processes utilising transfer, offset printing and maculature evolved in conjunction with the development of the Modular System. Occurrences of maculature and *set-off* were observed in the earliest embossing experiments and were developed into specific processes through five stages of adaptation and refinement. The first three stages have been identified as: I Experiment, II Development and III Emergence of the Modular System and in this chapter an overview demonstrates that transferring and offset printing processes evolved from embossing exploration. The last two stages, IV Continuation, and V Growth of the Modular System, are outlined in Chapter 6.

The development of processes is traced here through the metamorphosis of the printing surfaces devised for embossing from receptors for transfer prints, to eventually forming the earliest compound matrices. Therefore the examination also demonstrates that the offsetting and maculature processes developed during the practical research are inextricable from the physical development of the Modular System.

Stage I Experiment consisted of two separate explorations of a series of six engraved acetal resin blocks and a set of linocut dies. The origins of the embossing, offsetting and maculature practices can be identified in a combination of both these experiments. The embryonic practices were further explored in the second stage as a means of generating interchangeable printing surfaces. **Stage II Development** marks a change in the investigative direction of the practical research: from embossing to offset and transfer printing. During **Stage III Emergence**, with the development of offsetting and maculature as processes, the interactive printing surfaces were scaled up and further adapted by fabricating removable and interchangeable parts: effectively forming the Modular System.

Definitions of *offset*, *set-off* and *maculature* and their utilisation in the project

Both *offset* and *maculature* were known to early European printers as technical occurrences or expedients of the printing process.

Offset and Set-off

Offset is effectively the mistake smudge of *set-off* recognised by early letterpress printers. Moxon (1683) explains its causes and how to avoid it.[1] The offset blanket of lithographic tin-printers may have given the term *offset* to the phenomenon as it was developed into a viable process for the printing industry. The transition of the term is traced in *Colour Printing and Colour Printers* (1910). When the author Burch describes 'the recent invention of lithography' with a rubber cylinder, he uses 'set-off' for the transfer of the image via the rubber onto paper. However, the last chapter of his book is written by William Gamble who, as editor of the *Process Year Book*, could dossier the latest developments in printing. Gamble refers to 'the "Offset" printing method' in the text. I have used the two terms here to refer to different manifestations of the phenomenon. The consciously developed process is called *offset* while the historic mistake remains described as *set-off*, but *set-off* also describes the quality in ink that is particularly sought for the success of the offsetting process. The reference, in Stage I Experiment, to *set-off* is deliberate: demonstrating that an accidental outcome had to be observed and exploited before becoming the process of offsetting.

Offset in the project is used to describe the printed results after two printing surfaces have been deliberately printed together. It has been demonstrated that the outcome from two printing plates printed together effects an exchange of graphic information. The

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[1] Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications.
P351 glossary description of set-off. 'Work that is newly *Wrought off* at the *Press* often *Sets off*, especially if it be *Fat Beaten* with *Soft Inke*: For when it comes to be *Beaten*, or sometimes only hard prest by the *Bookbinder*, the moist *Inke* spreads and delates it self round about the *Face* of every *Letter*, and sullies and stains the whole *White* Paper.' On p83 cites *Setoff* as a consequence of poorly boiled linseed oil in the ink which hinders drying ink '…so that when the Work comes to the *Binders*, it *Sets off;* and besides is dull, smeary and unpleasant to the Eye.' On p.283 Cautions the second pressman against sitting on a pile of printed paper to knock up the ink-balls 'but not upon a *Printed Heap*, least his weight pressing it cause the un-dryed *Incke* to *Set-off*:'

outcomes from inking one of the surfaces are various, and depend on which is inked, but the influence each block imparts to its counterpart could be broadly described as an offset. This technique for transferring graphic information between two printing surfaces has influenced every aspect of the project: from the generation of ideas, through directions taken during proofing, to printing sessions, where it often contributes surprise elements. The initially unplanned offsets are the main reason a single printing session involving twelve sheets of paper can produce four different prints, as in *Tripstrip Trio* (**Fig 5:13** p.137) and why prints are often produced in pairs. The pairs *Meanderedge Left and Right* show a straight double offset (**Figs 5:14i, 5:14j** p.140). In *Good Green Gums Left* & *Right*, further disparity is achieved by exploring maculature (**Fig 5:14n** p.140).

maculature

The term derives from the Latin *macula* meaning a spot or stain, which in English is probably most familiar as the root of the adjective 'immaculate', meaning spotless. Abraham Bosse (1645) describes blotting or blurring sheets as *maculatures*, and a practice of keeping a paler record, or saving a cleaning or blotting sheet, appears to have remained largely an intaglio expedient.[2] It was used by the Bank of England around the turn of the nineteenth century to save copper banknote plates from wear (which may have been a more widespread expedient).[3] However, the basic procedure of *maculature* is indistinguishable from the relief 'print off' cleaning operation that wood engravers employ in order to avoid over-damping boxwood.[4] Historical examples of relief maculature used as a process do not use the term and it is generally associated with subterfuge. Papillon (1766) sneers at the cheating engravers who judiciously wipe a block before printing a proof to accompany it to the printers.[5] Savage (1841) in his dictionary

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[2] Bosse, A. (1645). Traicte des manières du graver en taille-douce. Paris Charles-Antoine Jombert.p. 141-142 Translated by Faithorne as 'blurring-sheet' Evelyn used *maculature* in his translation but it as was not published until 1907 it may account for the rare use of the term by practitioners.
[3] Harris, E. M. (1967). Sir William Congreve and His Compound Plate Printing p. 73
[4] p.735 Jackson recommends cleaning with a cloth but that turps and lye can be used sparingly Jackson, J. and W. A. Chatto (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight.
[5] Papillon Jackson, W. A. C. a. J. (1861). A Treatise on Wood Engraving. London, Chatto and Windus. p.466

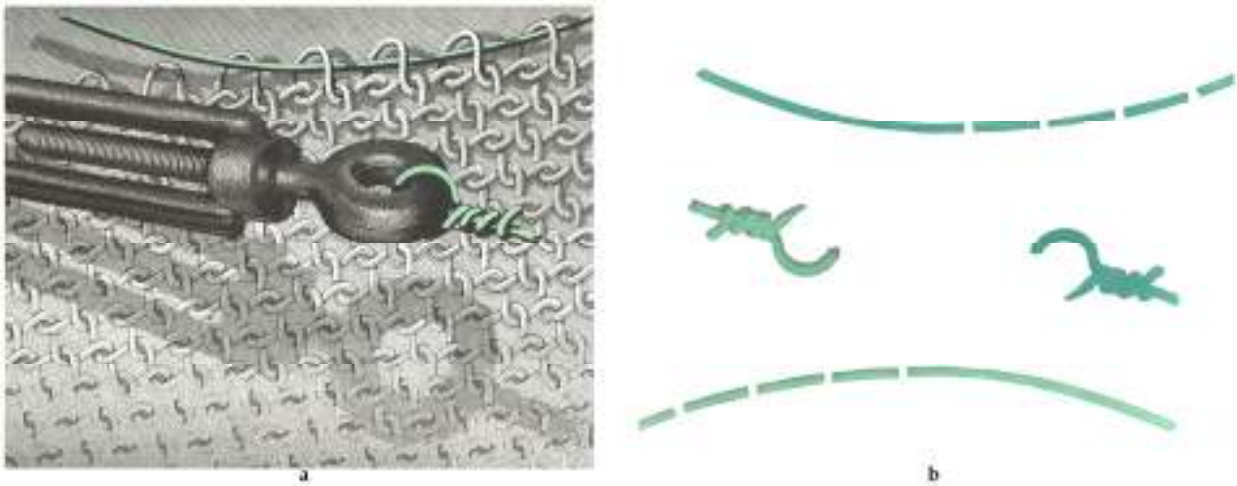

Fig 5:1 *Was* 1999 Engraving on acetal resin with an additional linocut for the green wire where the maculature or second inkless reprint was used: **a**) print, **b**) maculature waste sheet

uses 'macule' and Simmons (2002)cites' mackle' for the mistake blur - both which appear to be derivatives of maculature.[6]

Maculature in the project. It was by cleaning boxwood by inkless printing that the particular characteristic - of a pressure-applied layer of ink too thin to be rolled onto a block – was originally appreciated.[7] Maculature was employed for a tonal quality that differed from a colour lightened by the usual practice of adding a reduction medium. To overprint the verdigris wire of the 1999 wood engraving titled *Was*, a linocut was first printed off twice on scrap paper (**Fig 5:1b** p.119).

Harnessing offsetting and maculature has contributed to changing the role of the press. Instead of a tool for realising an engraved print which is generally largely planned as described in Chapter 1, it will be shown how the press became involved in the entire printmaking process during the development of the Modular System.

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[6] Savage, W. (1841). A Dictionary of the Art of Printing. New York, B. Franklin. p. 467
Simmons, R. (2002). Dictionary of Printmaking Terms. London, A. & C. Black.
[7] The practice was learnt from Simon Brett 1979. He later wrote 'blocks should be printed clean in the press as far as they will go.' Brett, S. (2000). Wood Engraving: How to Do It London, Primrose Hill Press. p.100

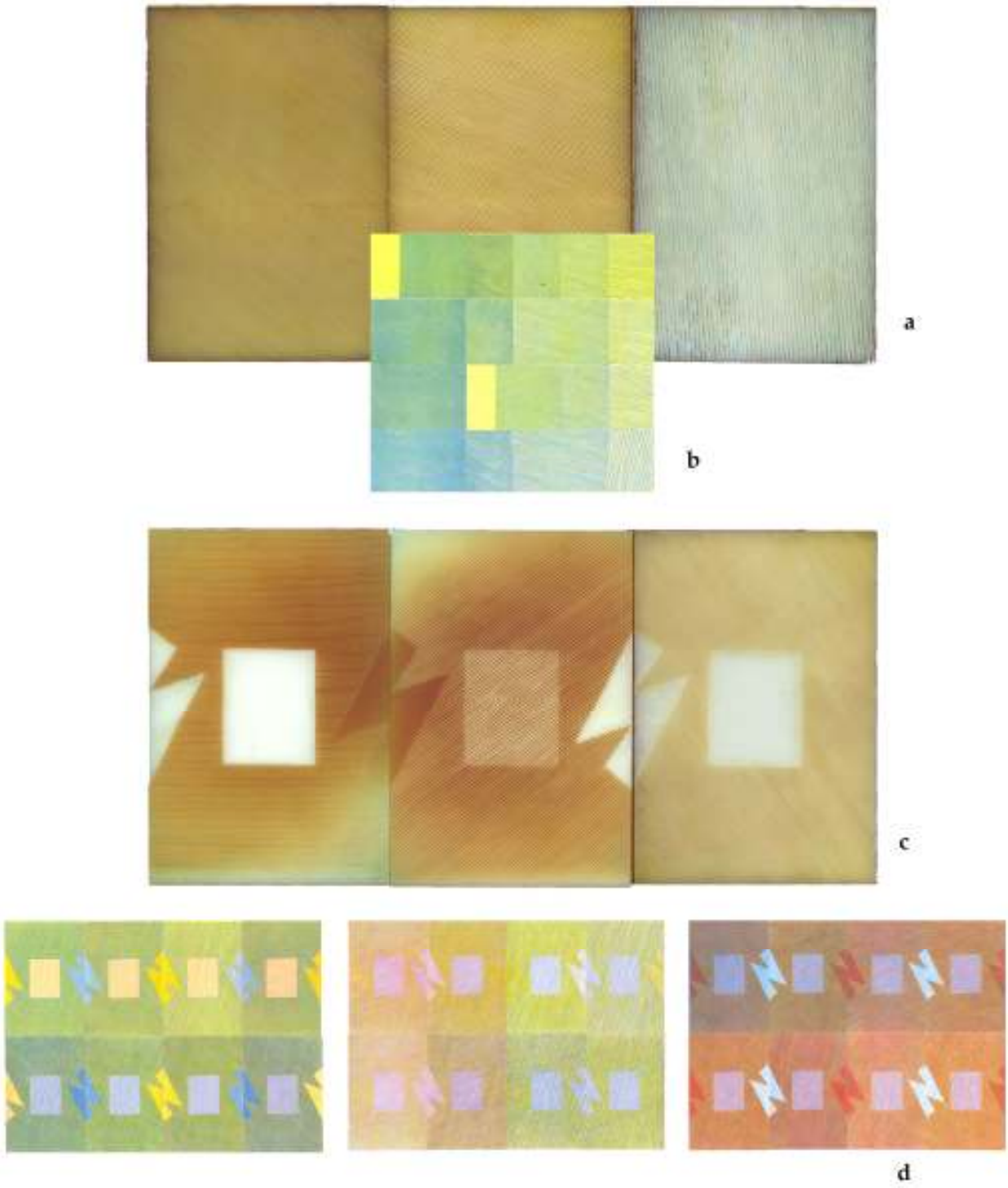

Fig 5:2 Tint Block Experiment: **a**) original tint blocks cut on 90 x 60 mm acetal resin, **b**) colour generated by two tint blocks, **c** adapted tint blocks. **d**) Collages, composed of eight prints from the adapted tint blocks.

Stage I Experiment

For the first of two exploratory experiments, six acetal resin blocks were engraved to test the concept of interactive and re-usable tint blocks (**Fig 5:2** p.120).[8] The basic process used did not differ from methods developed for three-block colour wood engravings outlined in Chapter 1. However the idea was to put the process to a different use. The impetus, to investigate the possibility of using colour and tone generated by engraved line for alternative purposes, addressed the dilemmas outlined in Chapter 2.

The uniform 90 x 60mm engraved blocks generated a selection of colour samples from printing two blocks and identical red, yellow and blue ink (**Fig 5:2a**). The yellow and blue combinations are shown in **Fig 5:2b**. These blocks differ from the tint blocks of the Modular System only in scale – and with their corresponding *kentōban*, they remain viable components. However, their efficacy as modular printing surfaces was only identified retrospectively – after further modifications had rendered them too specific. A rotational pattern engraved into three of the blocks, was devised to generate a series of collaged prints in varying multiplications and colour combinations (**Fig 5:2c**). The collages composed from eight prints demonstrate that the dominant imagery imposed upon the simple linear blocks had the opposite effect to the sought-after versatility (**Fig 5:2d**). The simplicity required for the successful modularity of what retrospectively became the first tint blocks was recognised after one of the surviving un-adapted blocks was printed together with the linoleum dies cut for the second experiment (**Fig 5:3** p.123)**.**

[8] A third experiment involving lowering an engraving block was abandoned. Lowering is an historical engraver's expedient, practiced by Bewick and lauded by Jackson (1839) for the same reason: to pre-empt the prints taken from the blocks by indifferent printers. Areas of engraving slightly lower than the main surface of the block pick up less ink, even from a block carelessly overloaded with ink. Contemporary engravers Paul Kershaw and Claire Dalby both lower areas of their blocks, usually in its traditional areas – the background. Prints from lowered blocks exhibit a subtle grey against the black ink of un-lowered areas. Jackson illustrated his paean to lowering as the best method of making a printable block in any hands with a print taken from a block after lowering and before engraving. It shows fuzzy crayon-like black areas. The Stage 1 experiment consisted of lowering an *already engraved* block and the result: a blurring and widening of the engraved lines very unlike Dalby's and Kershaw's finesse, offered little potential in the project at the time and were overtaken by the efficacy of the other two investigations.

Cutting the set of linoleum dies in was intended as an exploration in an entirely different direction from the tint blocks (**Fig 5:3** p.123). Exploring embossing and variations in cutting depths with linoleum was suggested by Royal Mint experience and MA study. In conjunction with damp paper trials, the linoleum dies were cut and tested to determine the degree to which a paper substrate could be manipulated by embossing. The distortion and tearing of the paper, visible in the reverse and obverse prints, suggests that printing from dies requires a more amorphous substrate such as paper pulp (**,Figs 5:3b** ,**5:3c**). The precision cutting of a single image to match positive and negative dies was at odds with the original attraction of lino-cutting as a vehicle for greater immediacy. However, the experiment demonstrated the potential use of both sides of a heavily embossed relief print, as the underside of the print embossing differed in character (**Fig 5:3c**).

Although the success of the plain engraved tint blocks initially went unrecognised and the die-cutting was eclipsed by the potential indicated by damp paper and deep embossing, the research gathered momentum when the two experiments were combined. The embossed proof with drawing shows how the concept of distorting engraved lines by embossing grew from the linocut dies (**Fig 5:3d**). When the linocut dies were embossed over prints from the engraved blocks, a residual linear image was *set off* onto the surface of the bottom linocut die (**Fig 5:3e**). The print taken after the embossing illustrates how damp paper facilitated a printable image from this *set-off* (**Fig 5:3f**). A second print taken without re-inking produced a paler but viable *maculature* (**Fig 5:3g**).

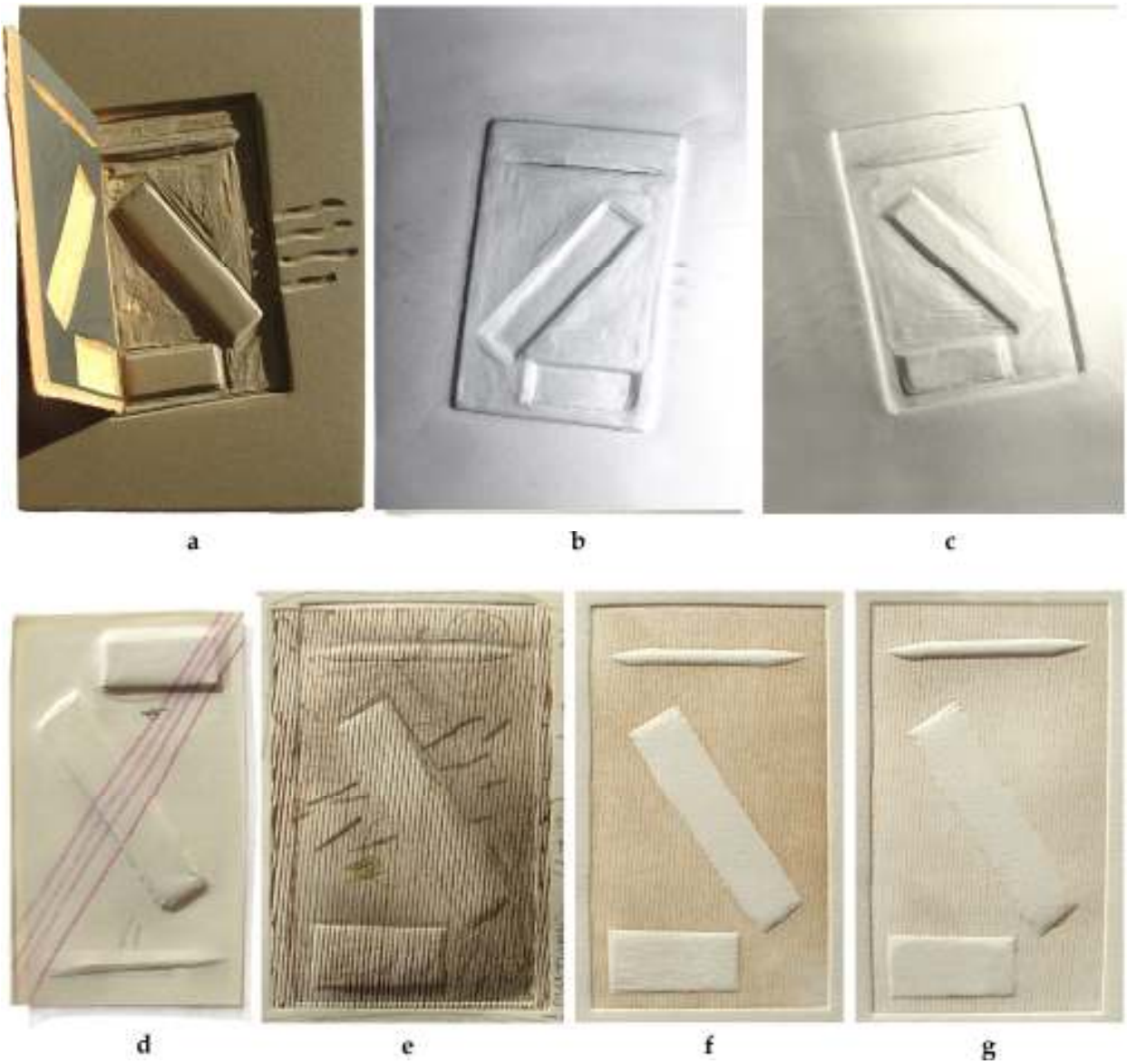

Fig 5:3 Linocut dies:
a) showing positive and negative fit, **b**) obverse, **c**) reverse blind prints from the dies show paper distortion and bruising: the underside of the embossing indicated potential for verso embossing.
Experimental proofs from the dies:
d) proof with drawing anticipating distortion of linear engraving through embossing, **e**) embossed engraved block, **f**) print taken from the negative lino die after embossing. The image *set-off* from the engraved linear block printed clearly onto damp paper. **g**) A second *maculature* or inkless reprinting of the same lino.

Stage II Development

Developments in Stage II combined the linoleum and acetal resin printing surfaces to further explore embossing and the efficacy of damp paper. It will be seen that at the culmination of these embossing developments of small linoleums compatible with the tint blocks – *Tank*, *Slats* and *Simplestipes* – the *set-off* imagery which constantly occurred marked a change in focus.

For *Tank*, the die concept was modified into a specific embossing linocut (**Fig 5:4b** p.124). Both linoleums matched the emergent tint block size 90mm x 60mm to facilitate overprinting. The outcome from embossing *Tank* directed the research away from representational graphic imagery. The embossing process appeared unsuitable for single narrative purposes, which also demanded isolated applications of linear tone: in only the water tank for example. While the reverse side of embossed paper attracted interest in the other experiments, it can be seen that the convex reverse embossing of *Tank* was specifically negative (**Fig 5:4d**). From this development on, the verso impression continued to arouse more interest than descriptive uses for embossing. Although the double cutting of linoleum again proved arduous for a single purpose image, the embossing linoleum for *Tank* is the ancestor of the compound matrices (**Fig 5:4b**).

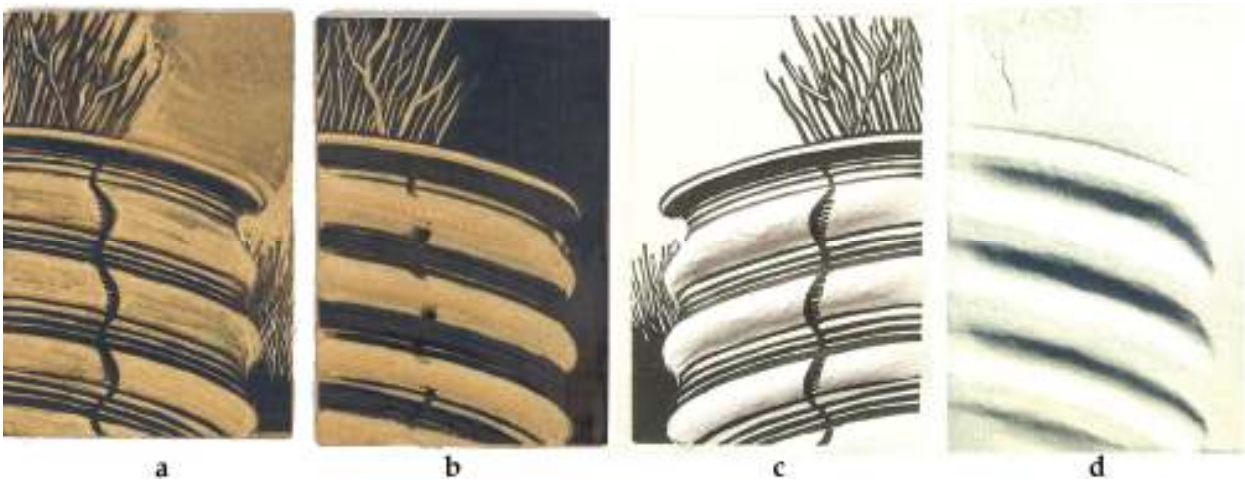

Fig 5:4 Stage 2 *Tank* Dec 2006: **a**) linocut, **b**) dedicated linoleum embossing linocut, **c**) embossed print showing visible paper distortion, **d**) negative verso impression from embossing.

The value of cutting embossing linoleum that was more modular than *Tank* was recognised in the next development, with *Simplestripes*, *Slats* and *Pole* but for a different purpose (**Figs 5:5**, **5:6** p.125). In the broad cutting of linoleum for embossing was found the required disparate graphic treatment which made offsetting and transferring into viable processes. That *Tank* was abandoned before overprinting with tint blocks is evidence of this shifting emphasis. The linocuts were matched in size to the tint blocks which needed no further modification. The requirement for simple linear treatment as a prerequisite for maximum modularity was recognised during this experiment.

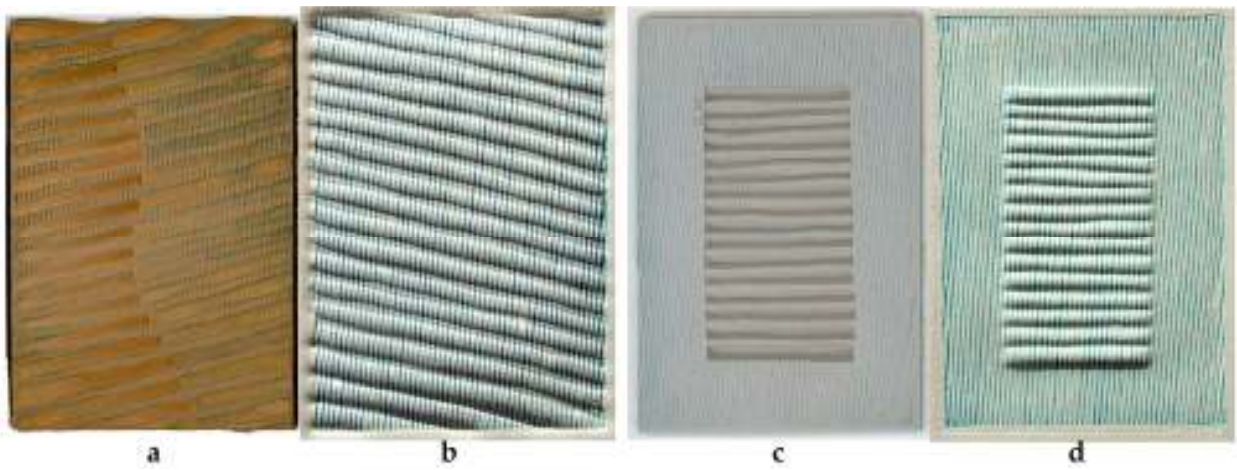

Fig 5:5 *Simplestripes* and *Slats*: cut to determine the potential of linear distortion by embossing. **a**) *Simplestripes* has two cutting depths, **b**) embossed over tint block, **c**) *Slats* with residual *set-off* is still visible after embossing over wet ink tint for print at **d**).

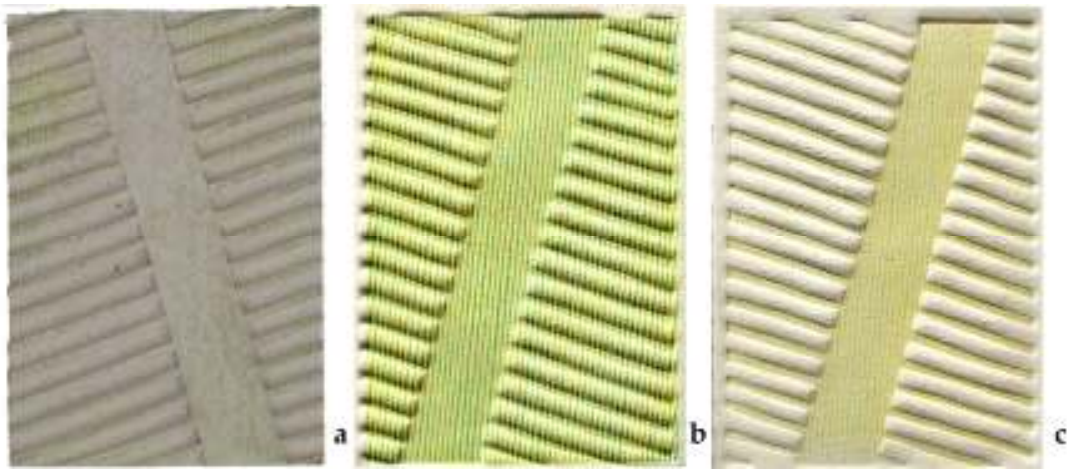

Fig 5:6 *Pole 1* **a**) cut linoleum**, b**) print of two tint blocks embossed with *Pole 1*, **c**) impression printed from *set-off* on *Pole 1* directly after embossing.

The object of the experiment was to investigate the concept of selectively embossing areas of relief printing by harnessing the principles of make-ready, or the letterpress manipulation of tone by pressure. Make-ready generally consists of thin paper layers modulating the tonality of an inked print by increments of the paper thickness. It is a method of achieving tonal variation with minimal impression that historically addressed the letterpress requirement for un-indented printing on both sides of the paper.[9] The aim of the experiment was to use soft, thick overlays to question how far an embossing make-ready could selectively assume the impressing role of the intaglio blanket. It has been done before: make-ready was first used by the Bank of England for banknotes in 1853 to produce the effect of intaglio engraving from relief electrotype with a platen press and the practice of making ready continued until 1937. Initially, engraving metal in relief caused consternation with engravers approached by the Bank – who, in an echo of the personal bewilderment caused by the tonal inversion of imagery from offsetting, insisted that their work was first engraved in the familiar incuse, before being cut in relief out of steel. Their work was enhanced at the press with elaborate make-ready that took 'one skilled craftsman 130 hours' for a single two-note plate according to Mackenzie (1953), who describes the process in detail: adding that 'the use of this overlay together with the superb inking and the equable pressure of the platen press, was to produce a note which astonished the experts that so perfect a result could be attained by relief printing.'[10] Make ready in the late nineteenth century was used as the principle for making embossed lettering by cutting elaborate card positive and negative dies, which may have been similar.[11]

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[9] Hind, A. M. (1935). An Introduction to a History of Woodcut: with a Detailed Survey of Work Done in the Fifteenth Century, Dover reprint. p.5

[10] Although the Bank of England had purchased cylinder presses in 1852, '…after considerable trail and experiment, it had been decided that the best results would be achieved by the use of a platen press.' They chose a Napier platen patented in 1853. The make-ready tradition was replaced by chalk overlays in 1937. Mackenzie describes the making ready of the note plates and the process in detail. Mackenzie, A. D. (1953). The Bank of England Note, a History of its Printing. Cambridge UK, University Press. pp. 98 - 104

[11] 'Embossing by letterpress methods 'Southward, J. (1899). Modern Printing: a Handbook of the Principles and Practice of Typography and the Auxiliary Arts. London, 4 pt. Raithby, Lawrence & Co p.224

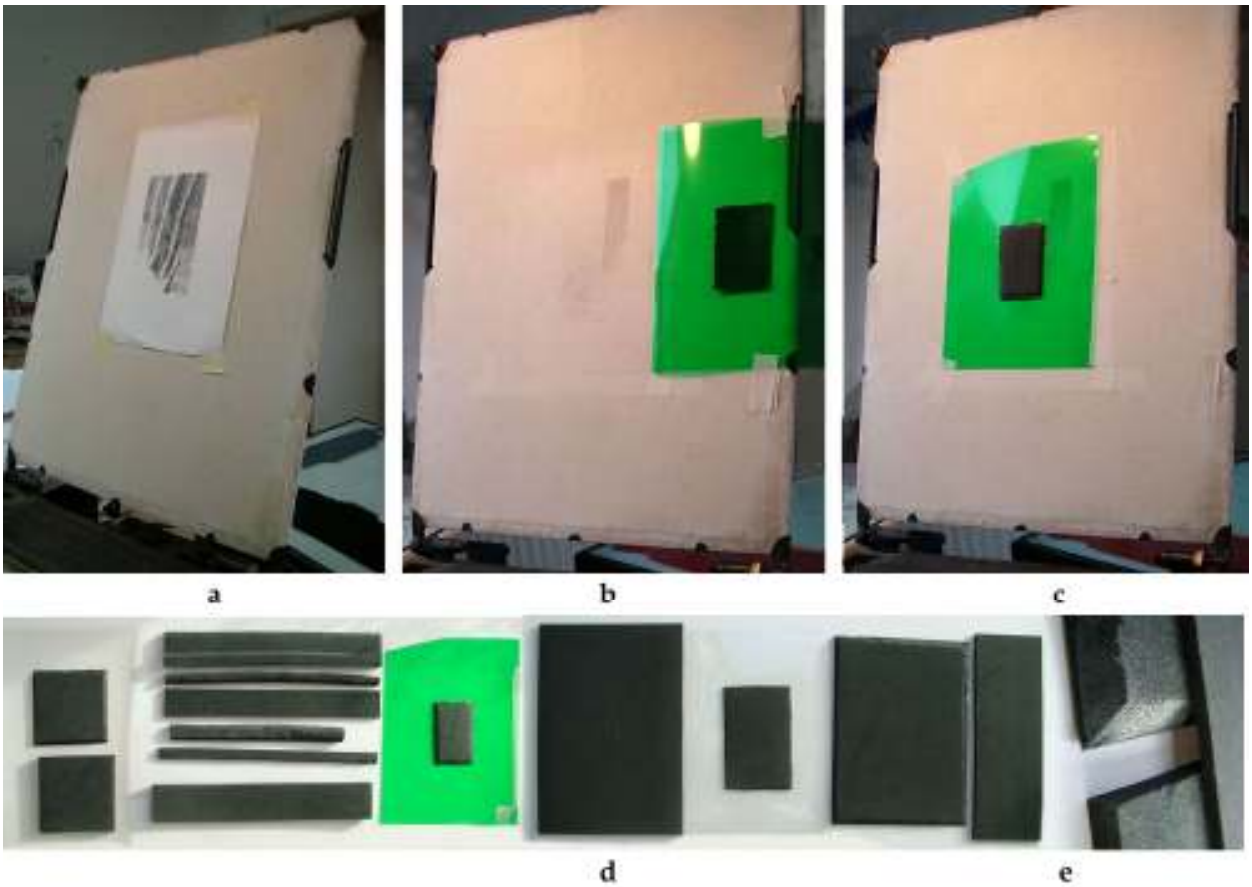

Fig 5:7 Make-ready and embossing: **a**) traditional make-ready for an engraving on the press tympan, **b**) archival foam embossing pad first swung clear for printing tint block, **c**) Plasterzote pad replaced for embossing, **d**) archival foam profiles and shapes used for embossing, **e**) detail of archival foam.

The linocuts *Simplestripes*, *Poles*, and *Slats* (**Figs 5:5, 5:6** p.125) were embossed with a chamfered rectangle of Plasterzote archival foam glued onto green acetate .[12] It was positioned on the press tympan as a traditional make-ready (**Figs 5:7b,5:7c** p.127). A hinge on the foam pad facilitated embossing and printing with a single paper-damping, which additionally expedited the development of offsetting as a process. It was swung out while printing the engraved tint block and back over the linoleum for embossing (**Figs 5:7b, 5:7c**). The wet linear engraving continually left a strong *set-off* onto the linocut embossing block, which the third embossing experiment actively exploited (visible in **Figs 5:5c** ,**5:6c** p.125). However, in both experiments and trials, the paper substrate

[12] Plasterzote is a high density polyethylene foam used for archival storage purposes. It is manufactured in a selection of *shore* hardness., or degrees of firmness, from 20 through to 90 shore, and in thicknesses ranging from 2 to 30 mm which offered even further potential for selective pressure.

distorted or tore before the archival foam overlay had ceased efficacy as an embossing tool. In *Tank* paper stress is visible in **Fig 5:4c**. The simply chamfered embossing foam pads, strips and rectangles (**Fig 5:7d** p.125) effectively embossed selected areas, but lacked precision: for example, to clearly impress the varying depths cut into *Simplestripes* visible in **Fig 5:5a** (p.125). This result was conversant with the two broad categories of Japanese woodcut blind impress (translated by Rebecca Salter as *Karazuri*: embossing and *Kimedashi*: heavy embossing).[13] The use of foam overlays continues for embossing, in conjunction with stiff brushes used in the manner of Chinese ink-dabbing originally from stone stelæ. During the development of the Modular System, foam continued to be adapted as a make-ready for specifically localised embossed areas, but with little further development. Archival foam proved to have great potential, particularly considering its varying thicknesses and shore hardnessnes (pliancy), but the paper trials indicated that its efficacy is hampered by paper grain, as seen in the die impressions (**Figs 5:3b, 5:3c** p.123) and with *Tank* (**Fig 5:4c** p.124). Further investigation, of how far archival foam could be used to fabricate a make-ready die to impress into acetal, linoleum or vinyl and linocut, indicated the use of paper pulp and a departure from the emerging direction of the research. However it remains a potential direction for future exploration with the Modular System.

The first interchangeable series of linocuts with *Small Poles* represent a turning point. Proofs from the *Poles* linocuts demonstrate how accidental set-off began its journey to exploitation as the offset process and the graphic implications of using offset imagery (**Fig 5:8** p.129). *Small Meander* was cut specifically for embossing (**Figs 5:8a, 5:8b**). However it was subsequently printed directly onto the surface of *Small Pole 2* linocut embossing block, instead of the previous reliance on the ink residue set off onto an embossing block (**Fig 5:8c**). The repercussions involved the residual image left on the *Small Meander* linocut after this operation, which were printed off for cleaning purposes (**Figs 5:8e, 5:8f**).

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[13] Salter, R. (2001). Japanese Woodblock Printing. London, A. & C. Black.p109 - 110

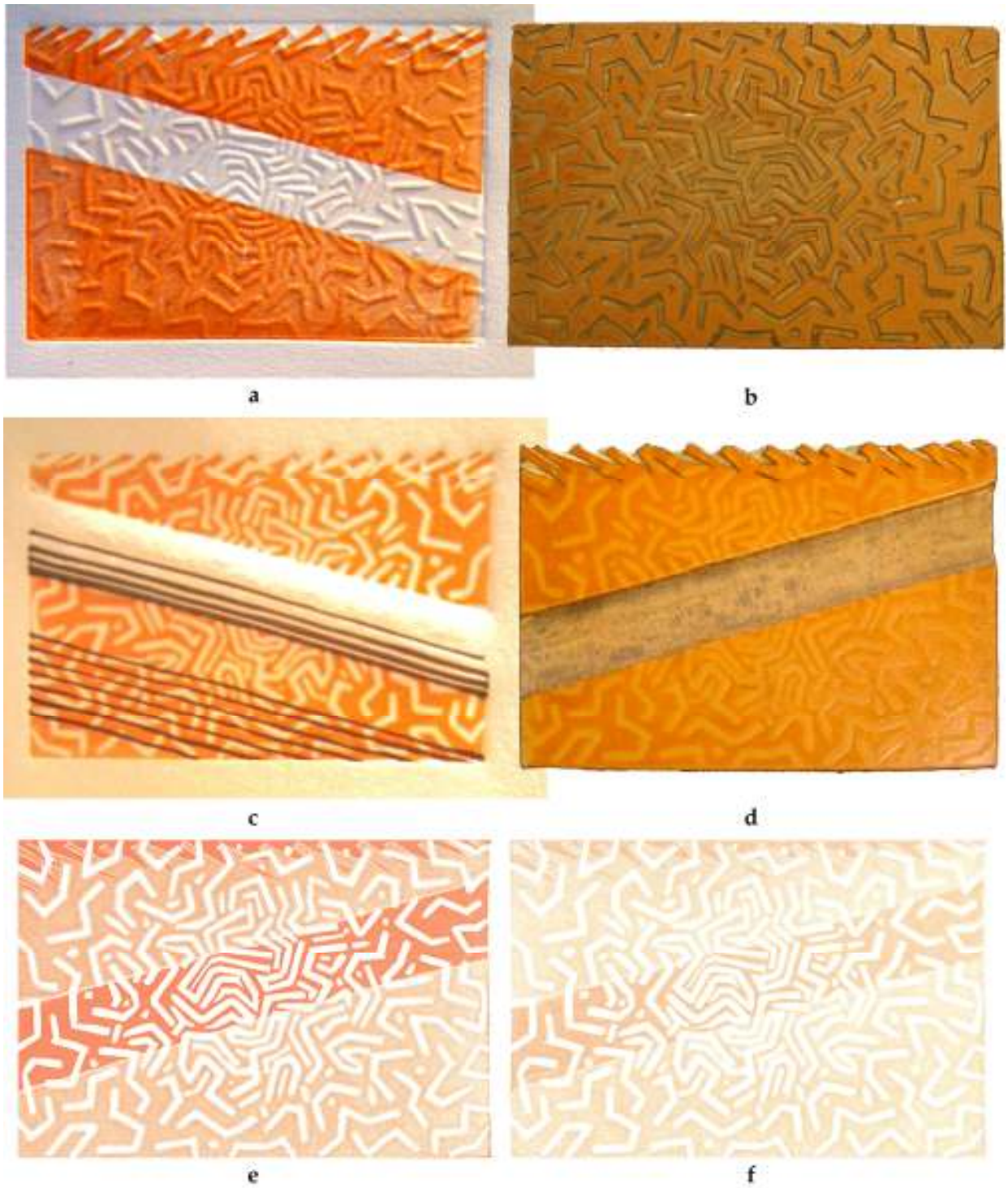

Fig 5:8 Embossing with *Small Pole* leads to printing residual offsets.
a) Print from *Small Pole 2* linoleum: embossed **b**) *Small Meander* linoleum
c) Print from *Small Pole 3* linoleum and **d**) *Pole 2* linoleum was used to emboss and print: after it had received an offset print from the *Small Meander* linoleum (seen in b), the residual offset is still visible on the surface of the linoleum. **e**) Offset print of residue left on *Meander* linoleum (at b), **f**) maculature offset print.

These residual, secondary offset prints indicated further developmental opportunities. They are wrong-reading to the *Pole* suite of linoleums, and the paler print is an inkless reprint or *maculature* (**Fig 5:8f**). Additionally the tonality is inversed: the pole strip and the jagged edge of the lino are the darkest tone. They demonstrated that two printing surfaces produced pairs of prints with different offset impressions from a single inking and in mirror symmetry. The *Small Pole 2* offset on *Meander* (**Fig 5:8e**) is right-reading to the *Small Pole* lino above it (**Fig 5:8d**). Additionally, the broad treatment of the *Small Pole* embossing blocks gave the requisite contrast in treatment, which contributed to the graphic potential of the offset prints (**Figs 5:8e, 5:8f**). This indicated that an offsetting process might depend on broad graphic treatment of one of the printing surfaces. Most importantly, the increasingly various combinations of the *Small Pole* and *Small Meander* linocuts introduced the concept of modularity for the linoleum surfaces in addition to the tint blocks. This development is shown in **Fig 5:9** (p.131), where printed variations from four linoleum printing surfaces: *Pole 1*, *Pole 2*, *Slats*, and *Small Meander* were combined by offsetting, embossing and overprinting.

The difference, between *direct transfer* printing and *offset transfer* printing, and how the procedures replicate printing surfaces that build different suites is shown in **Fig 5:10** (p.131). The blank linoleum (**Fig 5:10c**) which has received a wet proof (**Fig 5:10d**, taken from *Small Poles 3* at **Fig 5:10a**) demonstrates how all the *Small Poles* printing surfaces were replicated by offset transfer printing. The image offset onto the new linoleum preserves the orientation of the original printing surface and furnishes a compatible printing surface for a suite. William Savage (1770–1843) first used 'suite' to describe a set of compatible printing blocks and discovered 'obtaining a reimpression' for himself, but that he also described it as 'a plan, which the engravers on wood acknowledged to be the most accurate method of transferring an impression of one block to another' is evidence of common practice.[14] Conversely, the *Small Poles 3* lino (**Fig 5:10a**) has been printed by *direct transfer* onto a second blank linoleum (**Fig 5:10b**). This image, after lino cutting,

[14] Savage, W. (1822). Practical Hints on Decorative Printing. London. p.61

Fig 5: 9 Modularity established for linoleum: printed variations from four linoleum printing surfaces: *Pole 1*, *Pole 2*, *Slats*, and *Small Meander*.

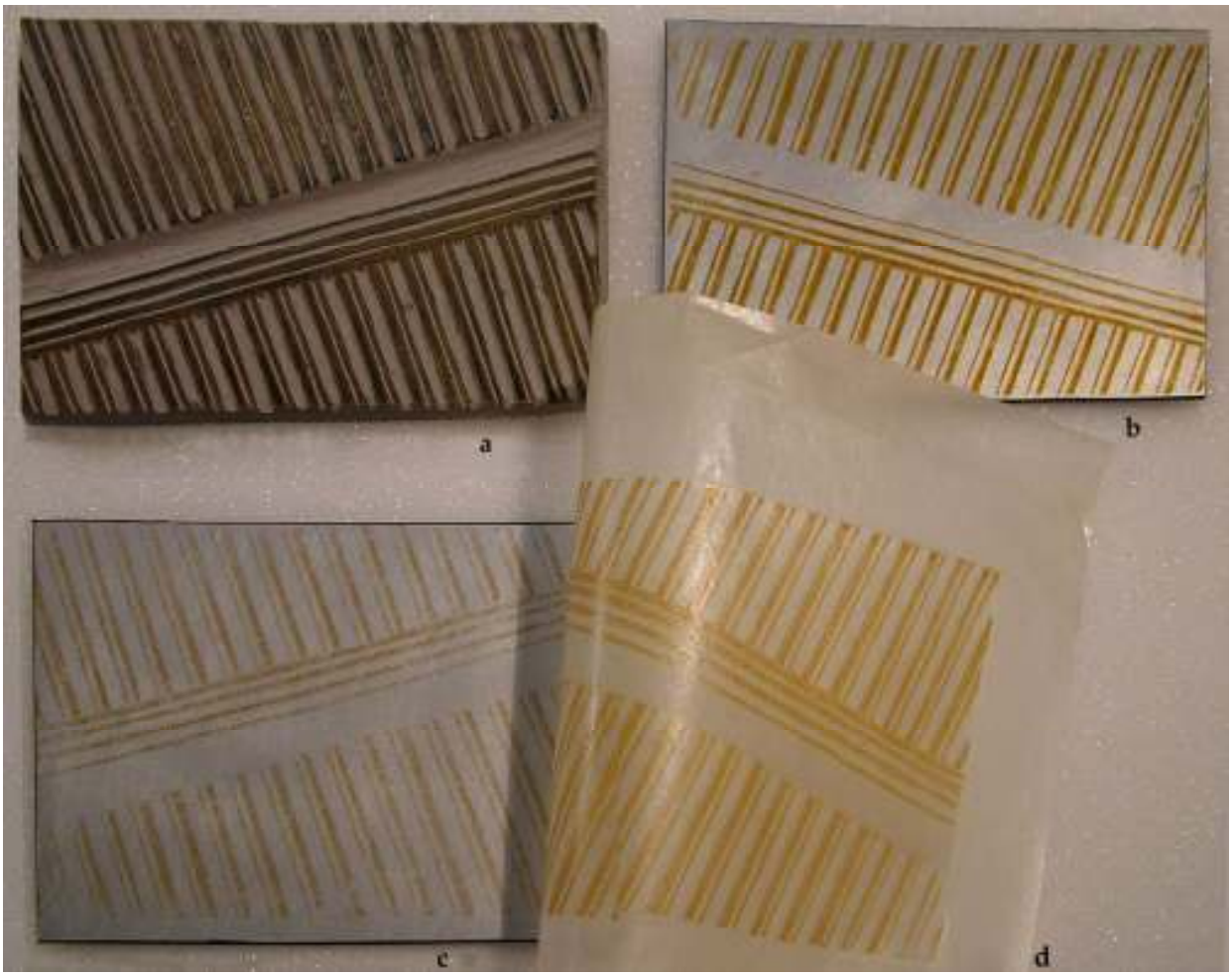

Fig 5:10 Offset and direct transfer: **a**) *Pole* 3 linoleum, **b**) a blank linoleum with *Pole* 3 printed directly onto its surface, **c**) a blank linoleum printed by a wet print of *Pole 3*, **d**) wet print of *Pole 3*.

produces a printable surface that is not part of the same suite and cannot overprint *Small Poles 3* in register.[15] However, it could be printed with the original set-off prints (**Figs 5:8e**, **5:10f** p.129). These linocuts were renamed *Small Contrapole* to avoid confusion: the Modular System components became increasingly peppered with such titles to identify the part of a compound series that accommodates the contrary offset imagery.

Direct transferring between printing relief surfaces exploits specific characteristics of the platen relief press. The clearance between the platen and the bed of the press accommodates the type-high (23.3mm) blocks, together with 3-4mm linoleum. The platen exerts enough pressure to convey ink between the two surfaces although one of them is upside-down. The immediate consecutive printing of the separated linoleum and acetal resin printing surfaces is little hampered by their disparity in height, which is accommodated by removing or placing a deep backing block for the thinner surfaces, in the bed of the press.[16]

The earliest embossing experiments and the increasing exploitation of offset imagery necessitated sourcing tougher, thicker papers. They had to both withstand embossing and pick up a maximum amount of ink from the lesser layer that is offered to the substrate by *maculature* and offsetting processes. The results of paper trials suggested Japanese papers and thicker intaglio printing papers. The processes exploited in the project continued to give better results from paper-damping according to Japanese methods.[17] The Zerkall paper commissioned for printing the colour engravings

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[15] Rummonds cites Savage as the first use of the term and it is useful in the project to identify compatible printing surfaces when so many are reversed. Rummonds, R.-G. (2004). Nineteenth Century Printing Practices and the Iron Handpress. London, British Library. p.652

[16] A further expedient for offsetting type-high blocks and deeper surfaces is to remove the tympan. The platen does not proceed to the kiss stage but enough pressure is gained for an offset transfer print between printing surfaces. The use of lower or resurfaced acetal resin blocks were considered but the decision to keep type height was made for standardization purposes: which limits technical tinkering.

[17] Salter, R. (2001). Japanese Woodblock Printing. London, A. & C. Black. p.48

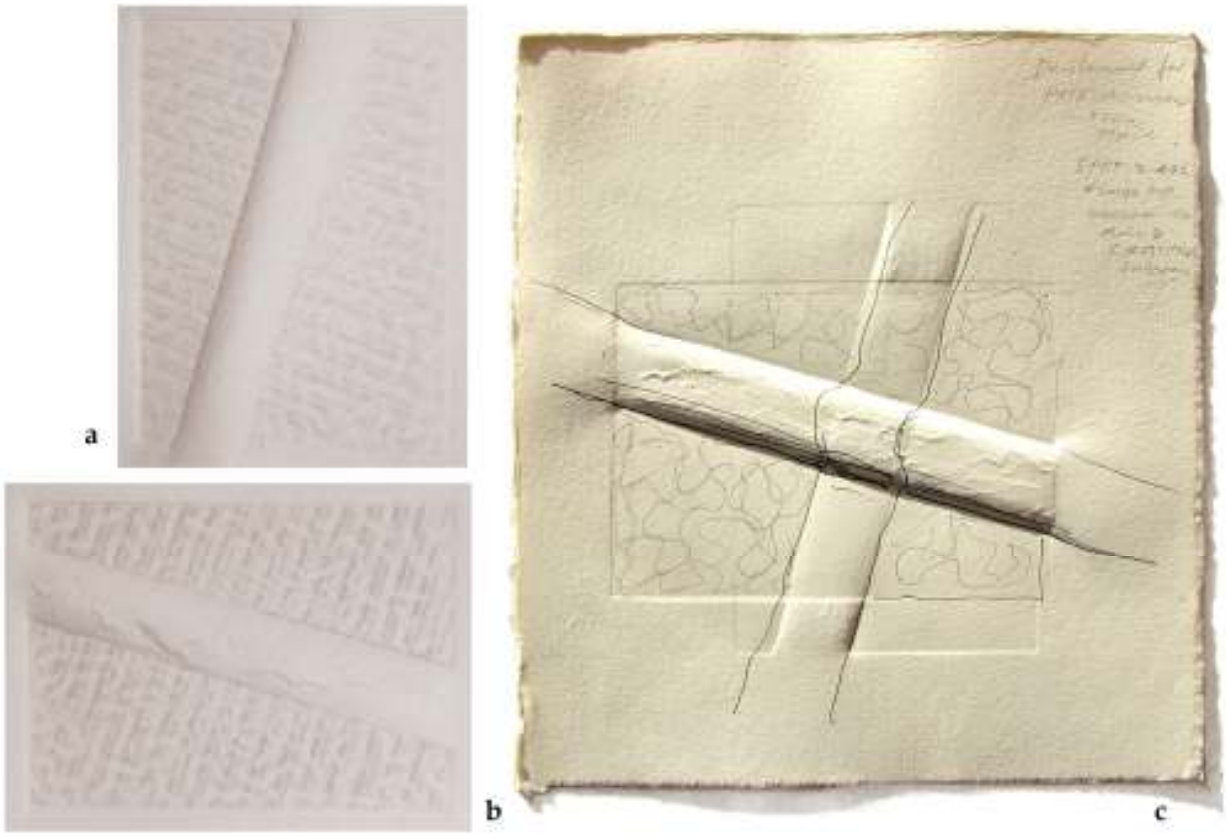

Fig 5:11 Paper experiments and repercussions: *Small Pole 2*: embossed on Somerset Satin 360gsm **a**)down the paper grain, **b**) across the paper grain showing that grain influenced the efficacy of deep embossing. **c**) grain-testing proof on Magnani 300gsm from rotated embossing of *Pole 2* shows more tearing and bruising against the grain.

(explained in Chapter 1) was specifically configured for dry printing but its use continues. It is valued for its capacity to hold colour and for experimental proofing, where it is possible to work through a greater number and variety of ideas without the complications of paper-damping.

Experimental proofs, for paper trials and offsetting, continued to offer graphic possibilities in unexpected quarters as exemplified in the grain-testing double embossed proof, conducted during *Small Pole* development (**Fig 5:11c** p.133). It shows how printing and proofing increasingly triggered both graphic and developmental ideas. In this case it formed the working drawing for part of a Stage III adaptation of *Small Poles* titled *Crosspoles*, but it also indicated a need to scale up from the 90 x 60mm printing surfaces.

Plans to extend the embossing surfaces emanated from this little proof and its overdrawing. The belated success of the tint blocks had also stimulated plans to augment their reduced range with larger tint blocks. Stage III primarily features the implications of this scaling up, combined with the discovery that more interesting imagery was offset on differently-sized printing surfaces.

Stage III Emergence

The Modular System emerged while adapting the printing surfaces to offset printing and maculature. The developments are exemplified in four series of proofs (pp. 135-40): *Pole Meander* (**Fig 5:12** p.135), *Tripstrip Trio* (**Fig 5:13** p.137) and *Tables* (**Fig 5:14** p.140). They show that the *Poles* embossing block (**Fig 5:8d** p129) was further developed into *Tripstrip Trio* and subsequently merged with *Tables* developments.

Pole Meander (**Fig 5:12** p.135)

The *Pole Meander* proofs and blocks demonstrate how the interchangeable printing surfaces developed unexpected proofs from offsets.

Fig 5:12a.This *Pole* embossing lino realised the plans to stretch the embossing area of *Small Pole* drawn onto the grain-testing proof (**Fig 5:11c** p.133). It set the template size at 200 x 276mm. The cut was carefully rounded to accommodate a chamfered archival foam strip for selective embossing.

Fig 5:12b The oblong tint block 10 is one of only four extant 100mm x 150mm acetal resin blocks described in Chapter 3 employed for the whole of Stage III. Although designed to replicate the effective tonality of their predecessors, they were engraved with different tint tools to further explore linear tone (**Fig 3:3** p.65).

Fig 5:12c *Meander Square* linocut 100 x100mm placed in one of a set of *kentōban* designed for printing and offsetting larger tint blocks and 100mm square linoleums. This *kentōban* centres *Meander Square* to the *Pole* embossing linoleum at **a**).

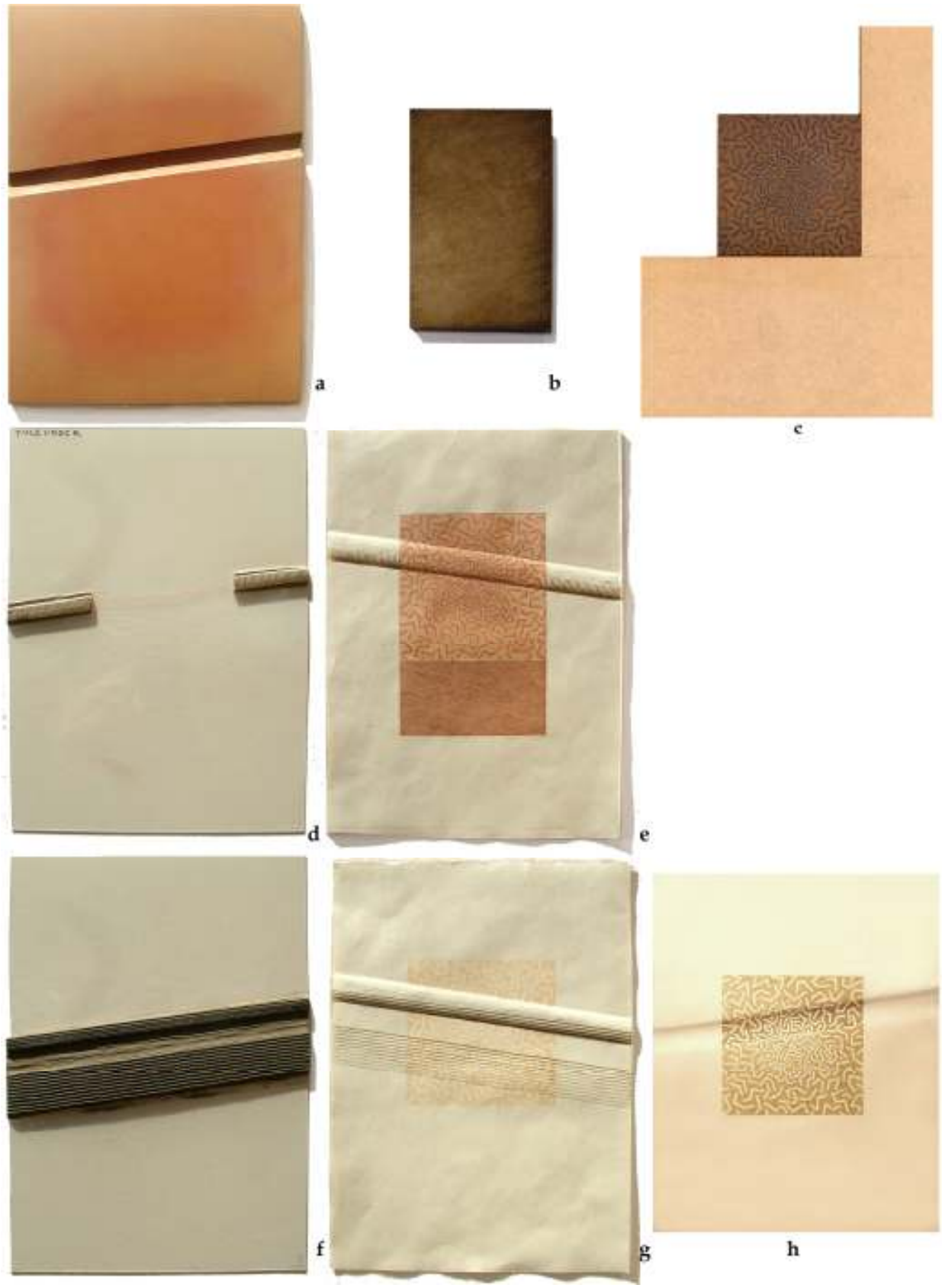

Fig 5:12 Stage III *Pole Meander* first proofs using scaled up components show how interchangeable printing surfaces contributed to the generation of unexpected proofs from offsets

Fig 5:12d This polycarbonate based linocut for *Polesunder* (**5:12e**) shows how it was first used to fabricate small linocut areas in register. Mounting linoleum for compound matrices was developed from this fabrication which also pre-empts holding compounds.
Fig 5:12e *Meanderunder* printed from oblong tint block 10 (**Fig 5:12b**) after its use to offset *Meander Square.* This unintended residual offset print exemplifies the unexpected results that arose from size disparity between the tint blocks and 100mm square linocuts.

Fig 5:12f The polypropylene based linocut for *Shadowpole* matches *Pole* embossing lino and was used to under-print *Pole Meander* at **g**).
Fig 5:12g *Pole Meander* This print was the ultimate aim in offsetting linear tone from oblong tint block 10 **b**) onto *Meander Square* **c**) before again offsetting the loaded linocut onto *Pole* embossing lino **a**). It was simultaneously embossed and printed from *Pole* embossing lino **a**) which held the ink offset by the *Meander Square* linocut **c**).

Fig 5:12h *Meandertrack*, another unexpected residual offset, is the result of printing the offset left on the *Meander Square* linocut **c**). Dealing with this print advanced the applications of embossing and coined a necessary word for the research. The reversed, pole-shaped tonal bar was *de-bossed*: placed facing up on the original embossing *Pole* block **a**), and indented with the same foam strip. It was in dealing with this offset print, right-reading like a Chinese stele to its printing surface, that the printed image was placed face up in the press and the dark offset indent tamped into the embossing *Pole* block at **Fig 5:12a** – making a converse track or groove, and using the same procedure as a Confucian scholar.

***Tripstrip Trio* and the development of compound matrices** (**Fig 5:13** p.137)
It can be seen in the metamorphosis of the rounded cutting of *Pole* emboss (**Fig 5:12a**), how offset prints re-interpret broadly cut shape. To fully exploit these surprising and unexpected residual offsets, a reversed version of the *Pole* motif was fabricated.
Fig 5:13a. The first compound matrix resulted from devising a printing surface for either embossing a square *Pole* profile, or printing various interpretations of the pole. The

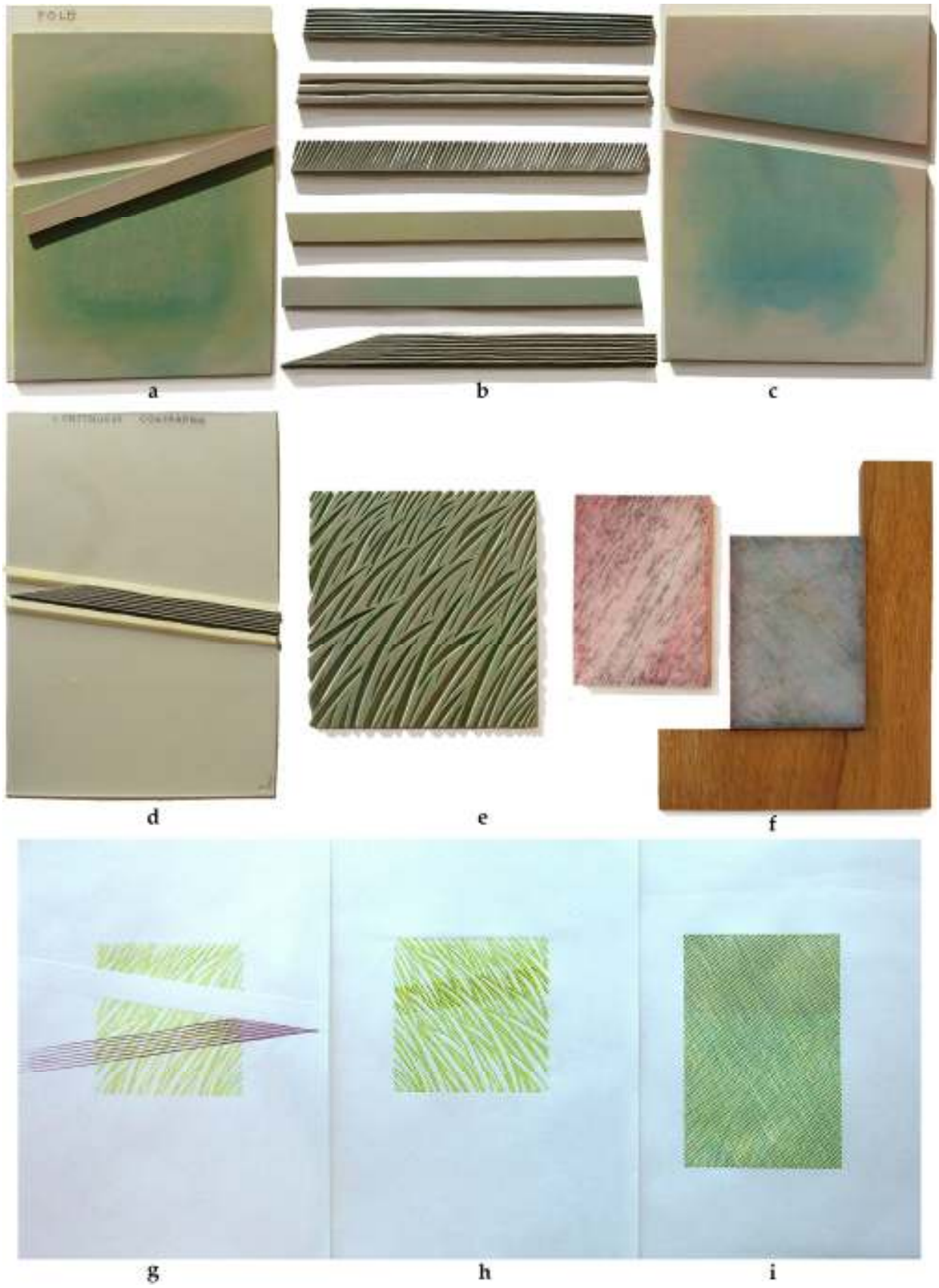

Fig 5:13 *Tripstrip Trio* and the development of compound matrices

original *Pole* emboss linocut (**Fig 5:12a** p.135) was replicated by offset transfer and the linoleum cut into three. The two main pieces were glued onto polycarbonate, leaving a removable *Pole* strip.

Fig 5:13b When various strips were cut to insert into the *Pole* space or to relocate in the subsequent *Contrapole*, they formed the original set of component parts (**Fig 5:13c** p.134). The original *Pole* emboss linocut was reversed for *Contrapole*, by direct transfer (**Fig 5:13d**). Polycarbonate replications of *Pole* and *Contrapole* were constructed for printing *Pole* components, or receiving offsets from tint blocks independently and are the first holding compounds. The *Contrapole* holding compound (**Fig 5:**13e) is shown with a shadow inserted for printing the first of *Tripstrip Trio* in **Fig 5:13g**.

Fig 5:13e *Grass* linoleum 100 x 100mm was used to receive offsetting from tint blocks before being offset in turn to *Pole* compound matrix in **Fig 5:13a**.

Fig 5:13f The oblong tint block 13 used to print yellow and subsequently oblong 22 in blue. No 13 is shown in the *kentōban* that centres oblong tint blocks.

Figs 5:13g, **5:13h**, **5:13i** ***Tripstrip Trio***. With the exception of the *Shadow* strip shown at **d**), the three prints have been printed from inking a single tint block with yellow and overprinting with a single blue tint block.

Fig 5:13g The print taken directly from *Pole* compound matrix with its offset from *Grass* linocut and embossed with a second pull of the press using a shallow foam strip.

Fig 5:13h The print from *Grass* linocut, where the pole re-interpretation is used as a shadow.

Fig 5:13i The print from both tint blocks is a maculature.

Modularity, Maculature and *Tables* (**Fig 5:14** p.140)

The development of *Poles* exploited the discovery that two offsets between printing surfaces are generated from one inked surface. *Tables* were further adapted to exploit the phenomenon which rendered offsetting effective. After offsetting, any tonal contrast printed from the surface that carried the ink is due to maculature. This describes the lighter areas which gave up their ink to the opposite surface. The examples of *Grass*

typify all offsets printed from the tint blocks, as during the three experimental stages, only the tint blocks were inked for offsetting (**Fig 5:13** p.137).[18] The overall pallor of the green double offset at **Fig 5:13g** denotes a full maculature.

The development of *maculature* as a process was expedited by the necessity to clear the ink offset onto the linoleum surfaces between printings. As explained in the Introduction, a quantity of relief ink may be removed by printing-off. Cleaning is an example of a prosaic task contributing more than its function to the development of the Modular System; while also furthering creative developments by the formulation of ways to avoid it. The ease of cleaning offset ink compared to a rolled layer has specifically expedited the development of offset processes: as in the offset pairing of *Meander Left and Right* (**Fig 5:14i** and **Fig5:14j**). Conversely, the attraction of dispensing with cleaning between every print has contributed to the development of maculature as a process. This development culminated with the maculature exchange described with *Good Gum Green* (**Fig 5:14n**).

The titles of the three *Table* compound matrices: *High Table*, *Low Table* and *Long Table*, illuminate the necessity to name and mark components specifically for identification as they proliferated with the expanding Modular System and became increasingly modular. and in the case of *Tables*, symmetrical and similar.

The first application of maculature is chronicled with the print *Parallel Stagger* (**Figs 5:14a** to **5:14f**). It is printed from all three *Tables* compound matrices with offsets from a single tint block 28, which is shown in its *kentōban* (**Fig 5:14a**). For offset printing, the inked block was placed upside-down in the *kentōban*: and placed over *High Tables* compound matrix in the bed of the press (**Fig 5:14b**).

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[18] Experiments established that the reversed image went the opposite way by inking the lino surface and were noted – but developments became increasingly confusing, with a bewildering plethora of contrary proofs. In order to further the research, a conscious decision to identify the reversed-back image as *printed from the tint block* (which was more interesting) was taken.

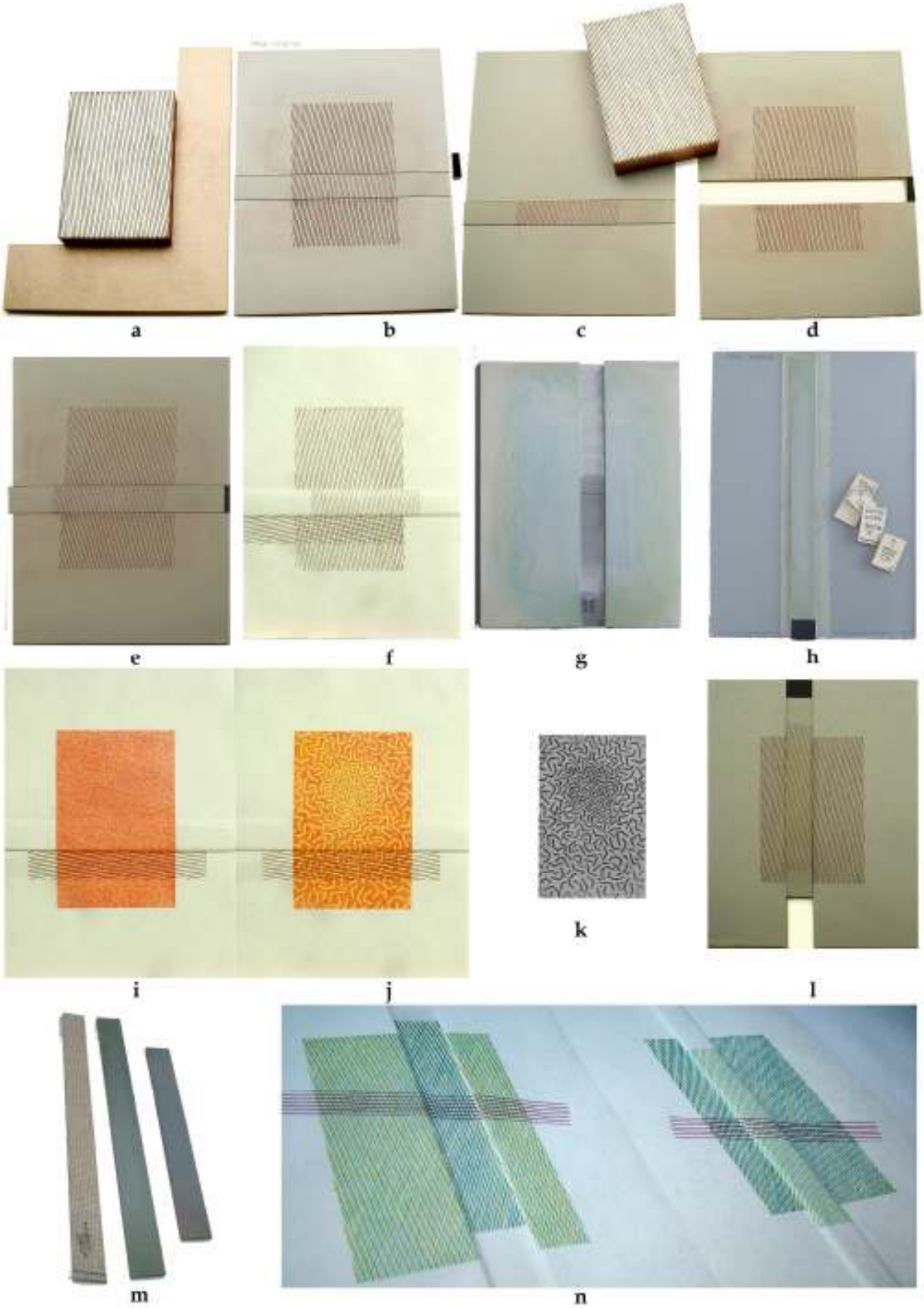

Fig 5:14: Modularity. Maculature and *Tables*

Fig 5:14b The offset from *tint block 28* is visible on *High Table* compound matrix directly after the operation. Note the black lino 6mm stagger strip ready on the right.

Fig 5:14c The offset parts (at **5:14b**) were separated before printing. The *Table* component strip was replaced in *Low Table* and printed to achieve a maculature version of the strip. It can be appreciated how printing off to no avail could generate the incentive to exploit the first ink print, which was achieved for *Good Gum Green* (**Fig 5:14n**). *Low Table* was used to print similar strips in *Meanderedge Left & Right* (**Figs 5:14i**, **5:14j**).

Fig 5:14d *High Table* compound matrix is shown awaiting the re-insertion of the printed-off strip and the little black staggerstrip. in place. It is shown assembled at **Fig 5:14e**.

Fig 5:14e The **r**e-assembled *High Table* compound matrix ready for printing a fully-inked offset on the compound matrix with an inserted maculature strip. The printed-off strip is replaced with the little black stagger strip from **Fig 5:14b** repositioning the strip.

Fig 5:14f The finished print, *Parallel Stagger Brown* after **Fig 5:14e** and with a second offset added under the maculature *Table* compound strip. This achieved a crosshatch using the same tint block 28: by offsetting a strip held in *Long Table* (**Fig 5:14l**). The strip was removed and placed in *Low Table* as at **Fig 5:14c** for printing. This printed strip is almost identically printed in *Meanderedge Left* and *Meanderedge Right* (**Figs 5:14i, 5:14j**).

Fig 5:14g *Long Table* was cut in order to capture the longer offsets from tint blocks used for the shadow strips under the *Tables* in *Parallel Stagger Brown* (**Fig 5:14f**) and *Meanderedge Left and Right* (**Figs 5:14i**, **5:14j**). It specifically enabled offsetting of different areas of the tint blocks and also additional cross-hatching.

Fig 5:14h *Long Table* holding compound. These polypropylene replications expedited the utilisation of the wasted printed-off *Table* strip from *Parallel Stagger Brown* (**Fig 5:14e**), by effecting a maculature exchange (explained with *Good Gum Green* **Fig 5:14n**). To the right are the various staggerstrips: used to move offset strips by accurate increments.

Fig 5:14i *Meanderedge Left* and **Fig 5:14j** *Meanderedge Right* used all three *Table* compound matrices and are an offset pair. Both were under-printed with a yellow tint block before printing from offsets. After offsetting red ink from tint block 13 onto the *Meander* linoleum (150mm x 100mm) at **Fig 5:14k**, *Meanderedge Left* was printed from the tint

block and *Meanderedge Right* printed from the *Meander* linoleum. For the shadow strip, the visible offset of tint block 28 onto the strip in *Long Table* at **Fig 5:14l** may help explain how the same block effected a cross hatch. The strip was replaced after offsetting into *Low Table* **Fig 5:14c** for printing. Lastly, the prints were embossed in an empty *High Table* (**Fig 5:14d**). A narrow linoleum strip, shown upside down far left at **Fig 5:14m**, impressed a flat square emboss into the gap.

Fig 5:14j The *Meander* linoleum (150 x 100mm) used to offset for *Meanderedge Left* and *Meanderedge Right* in **Figs 5:14i** and **5:14j** is a development of the *Small Meander* used in Stage II and the scaled up 100mm square was used for early *Pole* prints (**Fig 5:12** p.135)**.** This stage marks the start of the journey of the *Meander* motif described in Chapter 3 and was the first linoleum cut to match the size of the new tint blocks. However, the difference made with staggerstrips and the mobility offered by the compound matrices lessened the urgency to standardize the measurement of printing surfaces. The surprise potential of offset prints increased with the utilisation of disparate sizes of linoleum and acetal resin.

Fig 5:14l *Long Table* with an offset from tint block 28 set up for printing *Good Green Gums.* This is an example of capturing linear tone in different directions by orientation. *Kentōban* in landscape and portrait format were used during this stage in a strategy that foreshadows the later circular chase development.

Fig 5:14m The *Table* strips**,** which are inserted into the *Table* gaps and used with the collection of staggerstrips shown in **Fig 5:14h**. The underside of the embossing strip on the left is marked, as all linoleum components, with registration, orientation or measurements. The embossing strip illustrates how various embossing methods effected different profiles: archival foam at a shore hardness of 40 made a more rounded emboss – but future research might investigate harder foams (90 Shore Hardness for example).

Fig 5:14n Like *Meanderedge Left* and *Meanderedge Right (***Figs 5:14i, 5:14j**), *Good Green Gums* are a pair of prints that were generated simultaneously. They are the refinement of the maculature process into what has been termed *maculature exchange* for this practical project. After offset printing the tint blocks onto *Long Table*, **Fig 5:14l**, the removed strip

was staggered and printed by itself, in a *Tables* holding compound **Fig 5:14h**. It formed the dark de-bossed part of the left hand print and was set aside. The strip was replaced as in **Fig 5:14l**, where the paler strip is visible on the offset. The embossed right hand print was printed from this configuring, which features a maculature central strip. The strip was removed entirely and the empty *Long Table* compound matrix was ready to print the maculature background onto the retrieved original dark strip print. Thus both prints have a different *maculature* treatment, and *exchanged* offset printing components with different tonal inking. The tonality was emphasised by embossing. The print on left with the dark strip was de-bossed face-up onto *Long Table* **Fig 5:14j**, with the embossing lino at **Fig 5:14m** pushed into its face. The print on the right was embossed with the same lino strip face down in *Long Table*. The sap-red stripe on both prints utilised *Pole* components from **Fig 5:13** (p.137).

Thus the *Tables* series of compound matrices demonstrate the ongoing evolutionary nature of the Modular System at its emergence. It will be seen that *Tables* and *Poles* were eventually merged as the Modular System continued to grow.

of the Modular System

In **Stage IV Continuation** of the Modular System, a selection of exhibited prints was generated by continuing to develop interrelating components and compound matrices using embossing, maculature and offsetting. As the growing bank of components was still limited, these prints specifically exploited the modularity of the newly emerged Modular System. By contrast, the **Stage V Growth** of the Modular System was exponential, involving all aspects of the physical development including new materials, larger circular and rectangular tint blocks, press furniture and circular chases. They accompanied new applications for prints and proofs and indicated directions for further explorations involving the Modular System.

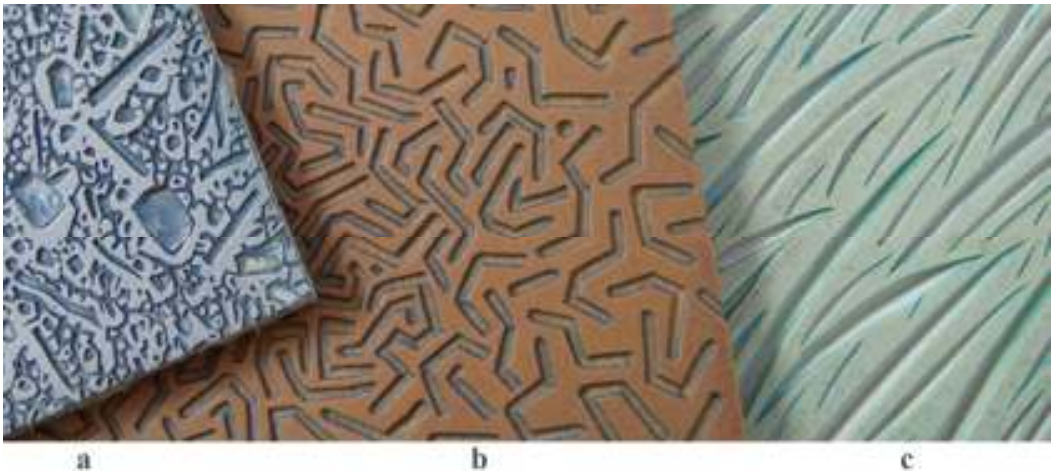

Fig 6:1 Linocut motifs which evolved during Stage IV: **a**) *Stones,* **b**) *Meander* and **c**) *Grass*

Names and marks

As printing continued to impinge further into the creative stage of printmaking, labelling, marking and recording all components and processes played an important role in preventing minute technical issues from dominating the artistic process. While this was particularly important during exploratory printing sessions, it continues to demand consideration as the compound matrices, cut components and early linocut motifs such as *Stones*, *Grass* and *Meander*, (**Fig 6:1**p.144) keep evolving.

Stage IV Continuation

Stage IV is characterised by the continued evolution of the *Poles* and *Tables* compound substrates and the continued expansion of the *Stones*, *Meander* and *Grass* motifs into variations of linoleum shapes and sizes (**Fig 6:1** p.144). The continuation of tint block cutting and exploration involved a survey of the colour generation potential of all two block combinations of the four 150 x 100mm tint blocks (**Fig 6:2c** p.146: the blocks are detailed in **Fig 3:3** p.65). Paper trials identified that Japanese Surinomo 90gsm held colour well and was thick enough for robust embossing. The Surinomo paper sample prints (**Fig 6:2a**) determined the printed hue and together with tracing paper prints (**Fig 6:2b**), supplied a ready method of planning the *Addonto* series of prints (**Fig 6:3** p.148).

The continuation of motif developments is inextricable from the development of different components for compound matrices and is exemplified in the *Addon* series with *Addon*, *Addonto* and *Long Addon* (**Figs 6:4, 6:5**, p.149 –150). They show that the motifs continued to spread into variations of linoleum surface size and to direct the fabrication of new compound matrices. Their evolution was interdependent with the continued development of embossing and offsetting processes, as the examples of the *Addon* series of prints and components show. An example the *Grass* motif (**Fig 6:1c** p.144). Strips and patches added components for *Addon* and the motif developed further for embossing beyond the original two oblong and square linocuts (**Fig 6:4c** p.149).

The format of the earliest *Addon* compound matrices (**Figs 6:4a, 6:4b** p.149), pays homage to the early Japanese colour printed kimono pattern book, the *Shinzen 0-Hingaata* (1680) printed from the same blocks in different colours (explained in Chapter 2) – and the fact that a printing block possesses this intrinsic potential for modularity with a simple change of ink colour.

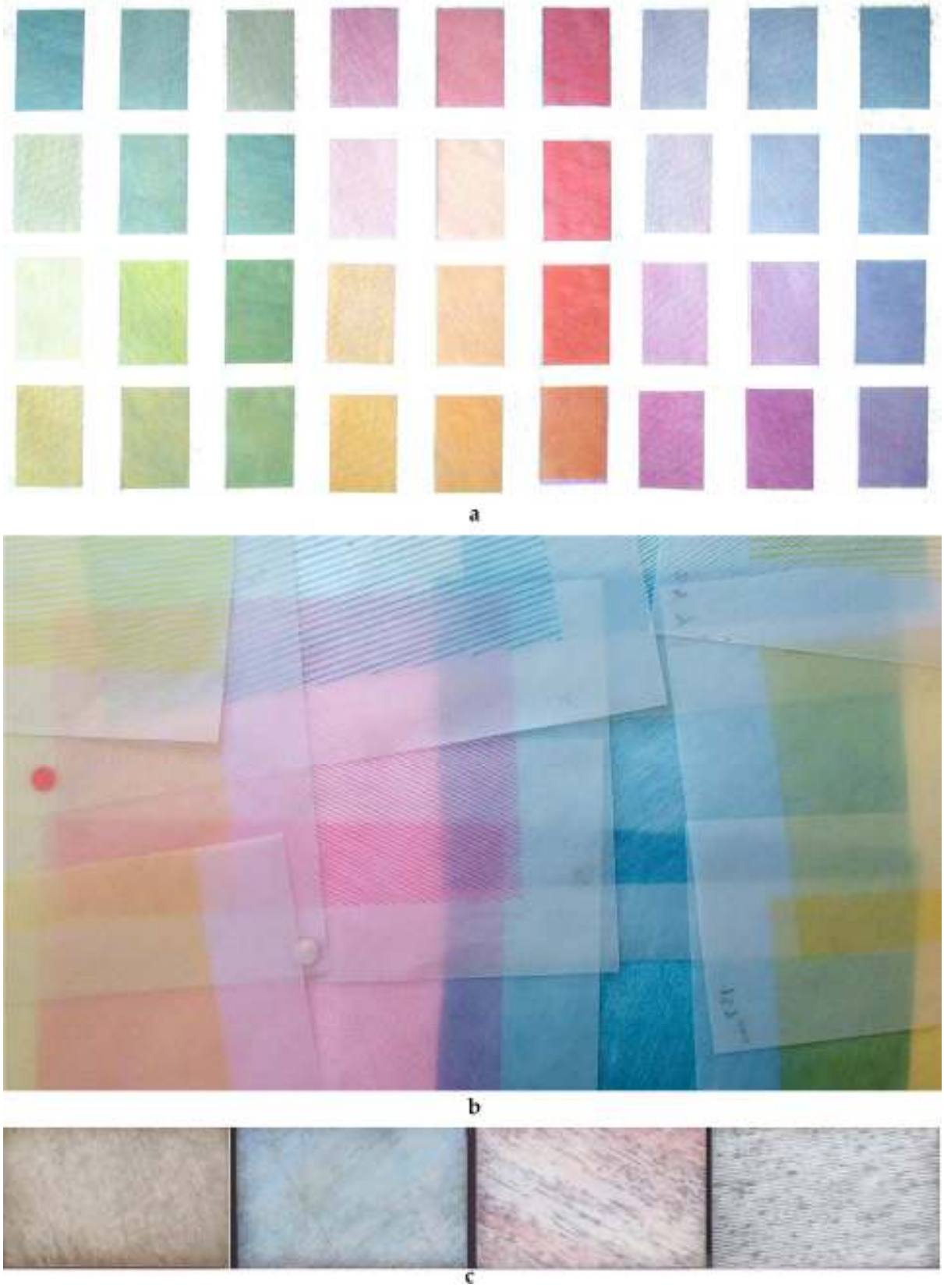

Fig 6:2 Colour samples generated by the first four tint blocks and three inks: **a**) on Japanese paper, **b**) on tracing paper, **c**) the first four tint blocks: each colour is two over-printed tint blocks.

The extent to which offsetting additionally re-interpreted the *Stones*, *Meander* and *Grass* motifs was exploited with the *Addon* series for a specific purpose. The prints in **Fig 6:3** (p.148) featured in an exhibition which centred on Australian expatriotism in Britain. The *Grass* motif investigated the green of Welsh hills while offset tint block prints from the *Grass* linocut metamorphosed into red Australian outback rock-forms.

Additionally, the interacting motifs and the composite linocut components (**Figs 6:3, 6:4**) demonstrate that extra parts for embossing took the graphic content of the print past the confines of the four tint blocks used in Stage IV (shown at the bottom of **Fig 6:2** and **Fig 6:4** p.148–149). It also demonstrates how the linocut component continued to metamorphose into different versions that eventually formed new compound matrices – the first was *Long Addon* (**Fig 6:5** p.150). The spreading graphic imagery afforded by linoleum that was still cut initially only for embossing was increasingly used to offset colour from tint blocks. This indicated the extent that offsetting enables graphic content to move anywhere about the second substrate – and that larger tint blocks would be required for complete freedom over where to place inked surfaces by offset. The *Poles* series of prints and compound matrices were eventually employed with larger tint blocks, but **Fig 6:7** (p.152) shows how they were developed in Stage IV with the original four oblong tint blocks. The back of an assembled *Crosspole* compound matrix shows marks for navigation and identification(**Fig 6:7b** p.152). *Contracrosspole* are reversed versions cut to reconcile offsets (**Figs 6:8b, 6:8c** p.153). The *Crosspoles* prints and compound matrices show the development from the original *Poles* compound matrix (**Figs 6:7, 6:8** p.152–3). The continued viability of *Poles* in conjunction with *Crosspoles*, together with the last extant development for this series of compound matrices, *Crossbeams*, exemplifies the continuing modularity of the Modular System (**Fig 6:8g** p.153). *Crossbeam* links the *Tables* compound matrices to the set. It was used with the first large tint block 28 to hold larger offset areas, which can be seen in the longer red ribbon (**Fig 6:8e** p.153).

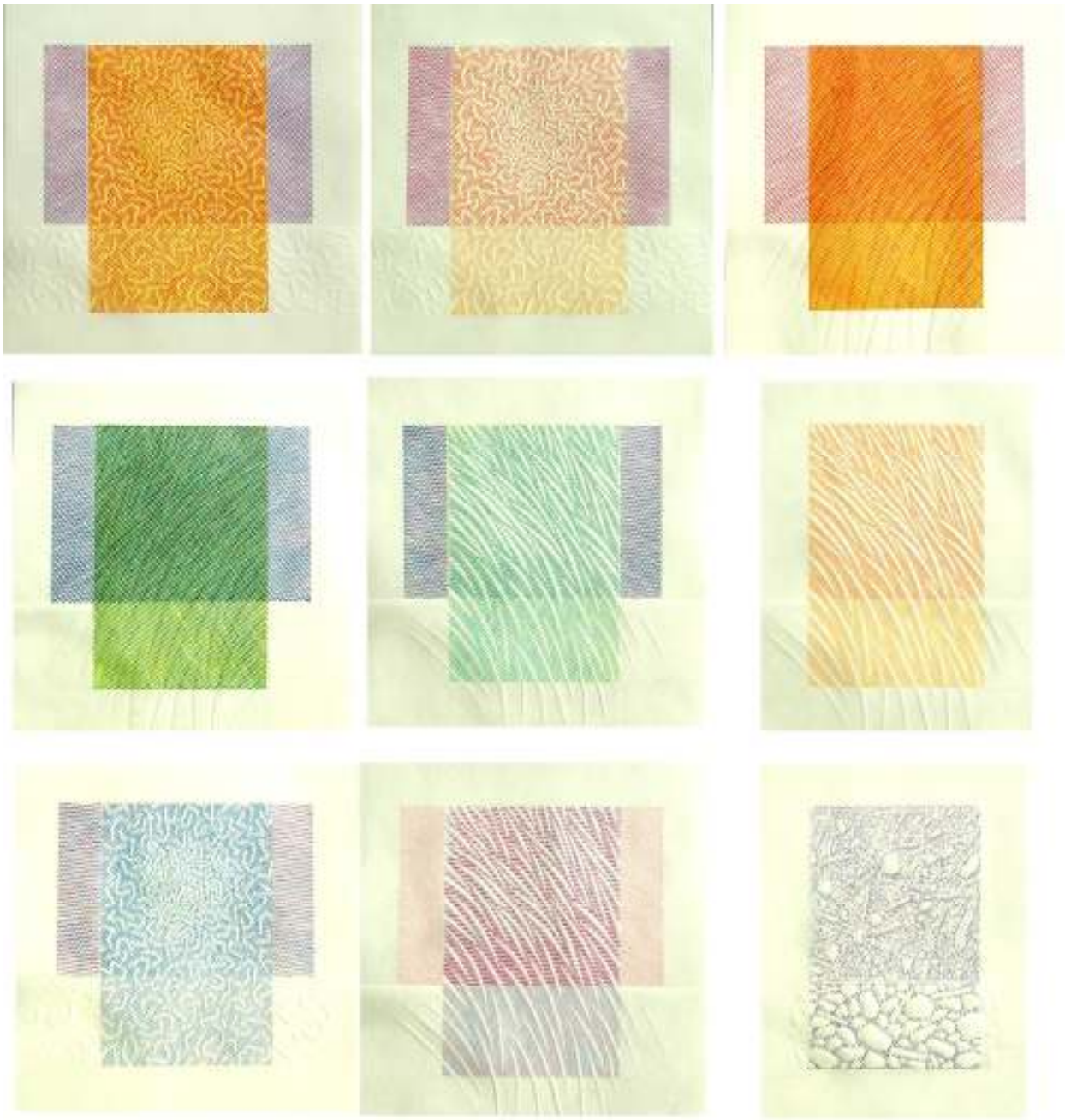

Fig 6:3 Prints from *Addonto* compound matrix and components - *Meander*, *Grass*, and *Stones* showing extended sections for embossing and re-interpretation by colour and offsetting.

Fig 6:4 The *Addon* series: **a**) *Addon* compound matrix with *Stones* components, **b**) *Addonto* compound matrix, **c**) *Grass* and *Meander* components, **d**) oblong tint blocks used with them in Stage IV.

Fig 6:5 *Long Addon* components and compound matrix, showing extended sections for embossing and fitting the same *Meander*, *Grass* and *Stones* components horizontally by extension

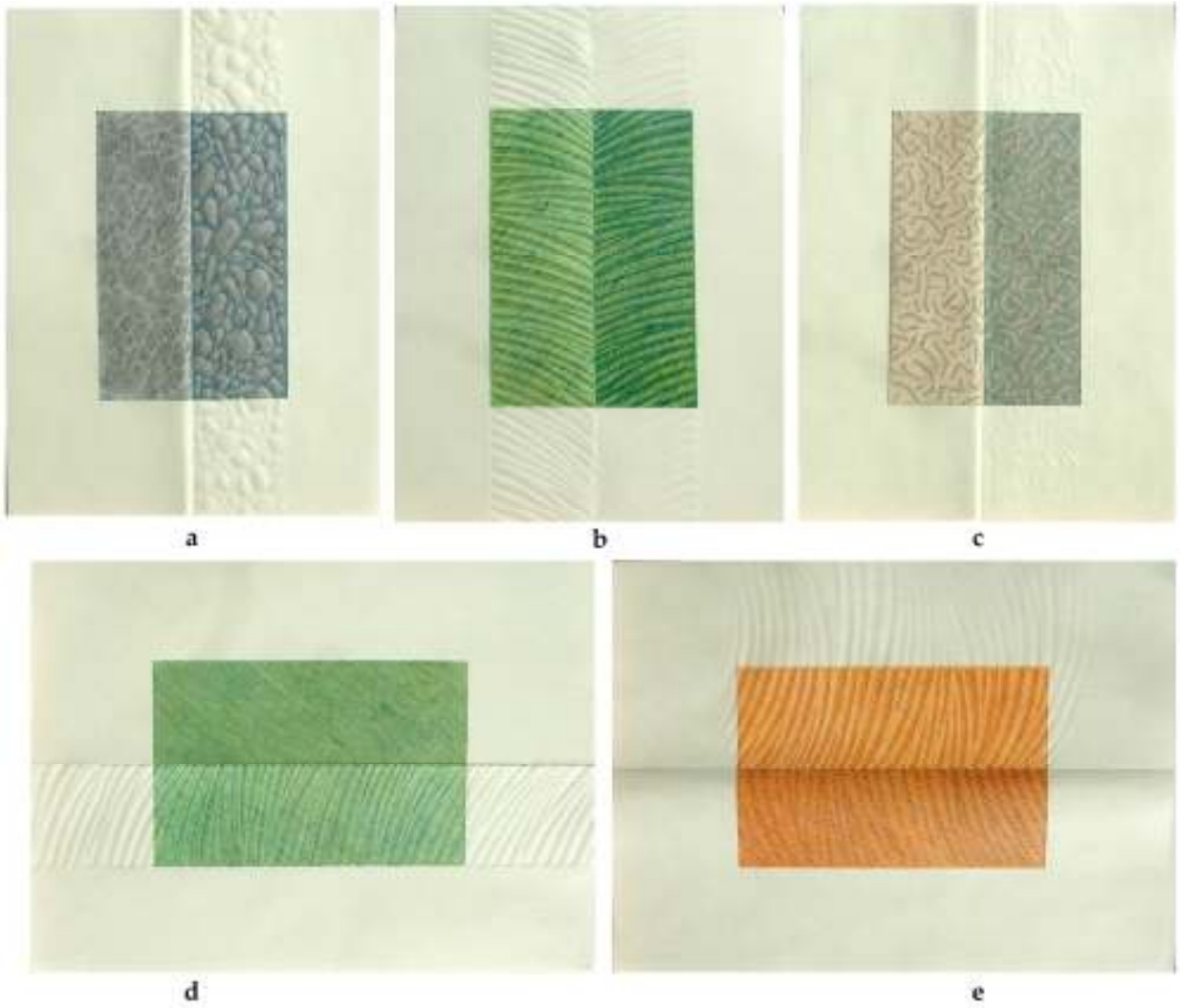

Fig 6:6 Prints from *Long Addon* compound matrix**. a**) Stones, **b**) *Grass,* **c**) *Meander*, **d**) *Cut Grass,* **e**) *Burnt Grass*.

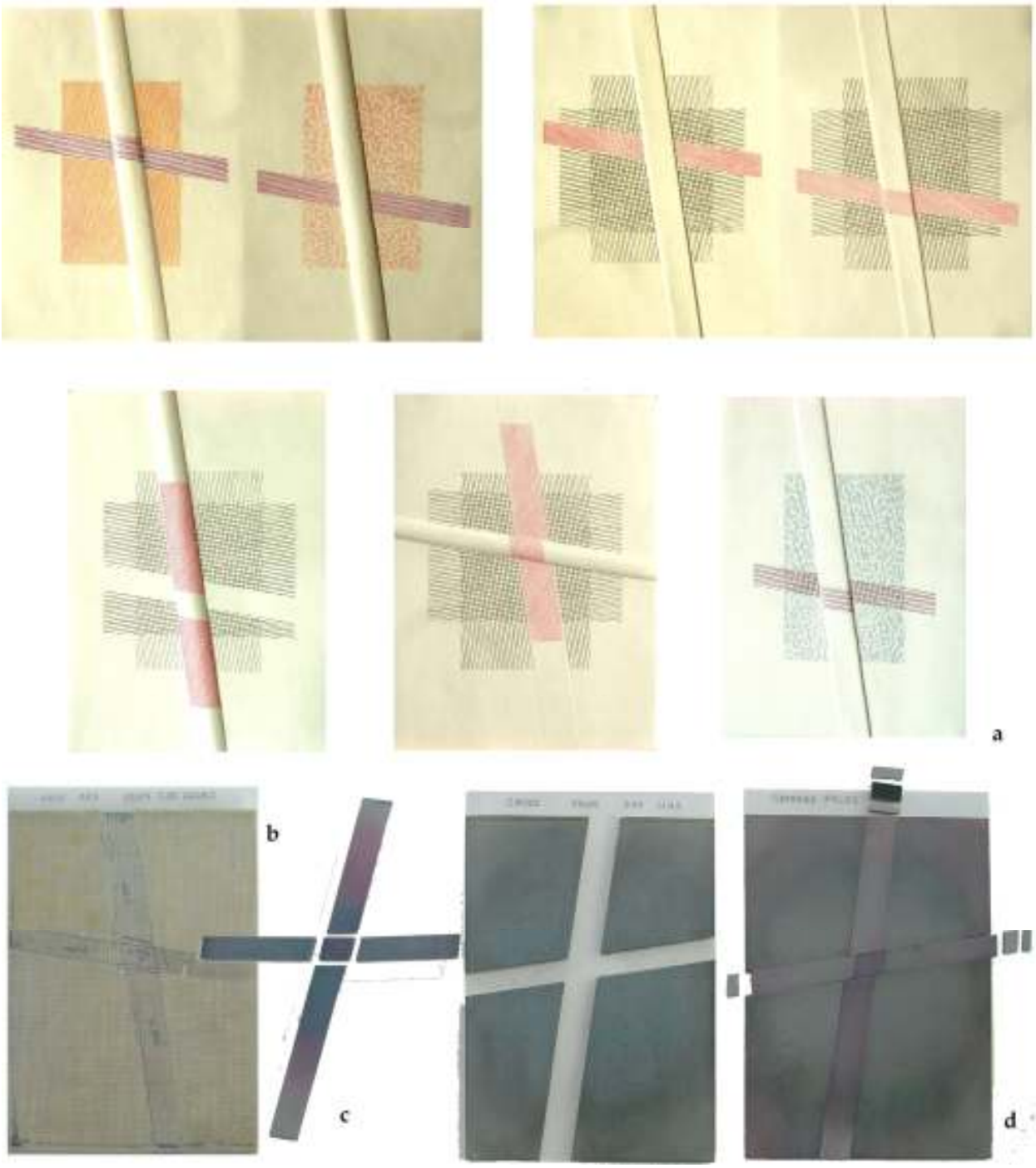

Fig 6:7 *Crosspoles*: **a**) prints, **b**) assembled compound matrix underside, **c**) components, **d**) compound matrices. Small stagger strips register sliding parts.

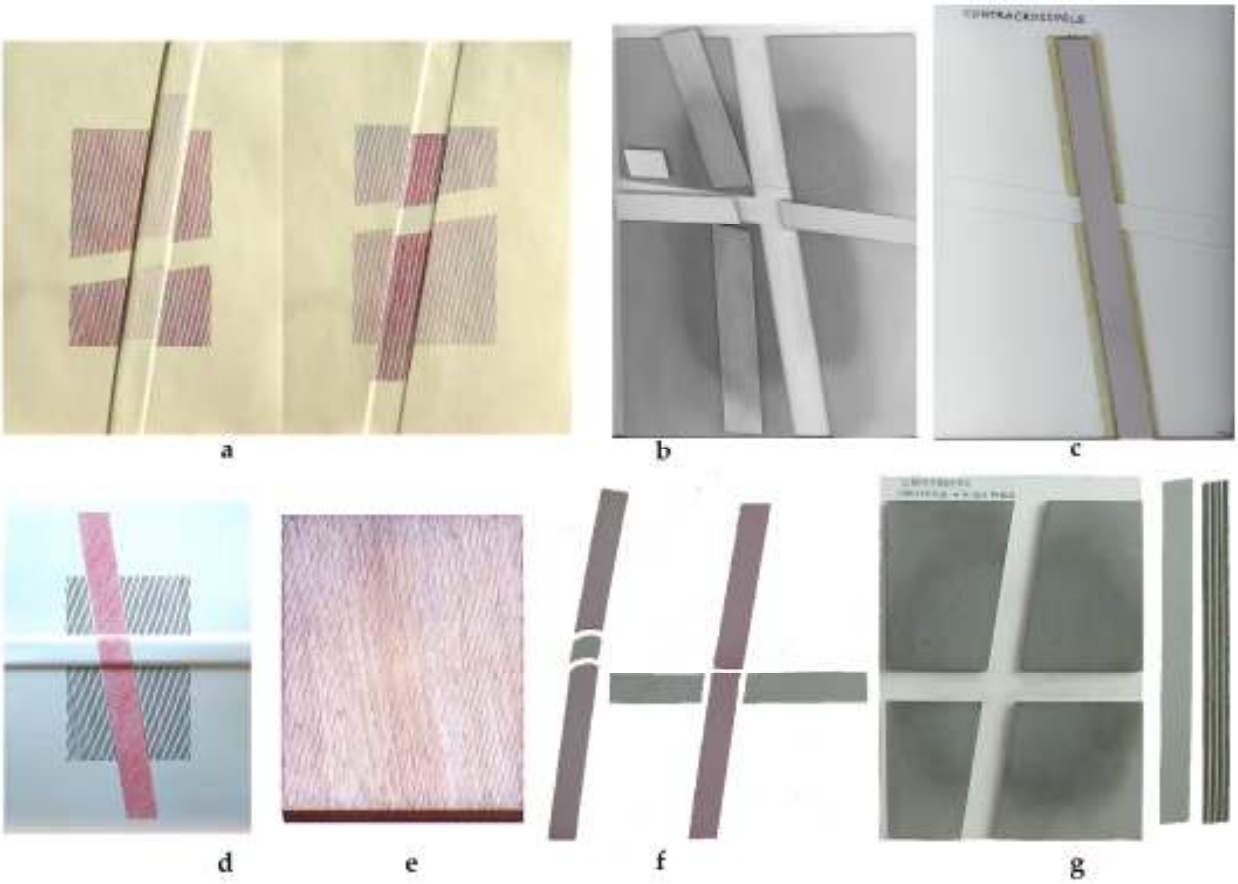

Fig 6:8 *Pole* cross-development: **a**) *Contracrosspoles* print, **b**) *Contracrosspoles* compound matrix is compatible with *Contrapoles,* **c**) holding compound.
Crossbeam is compatible with *Tables*: **d**) *Crossbeam* print, **e**) larger tint blocks utilised for print, **f**) different components can include *Table* strips, **g**) *Crossbeam* compound matrix.

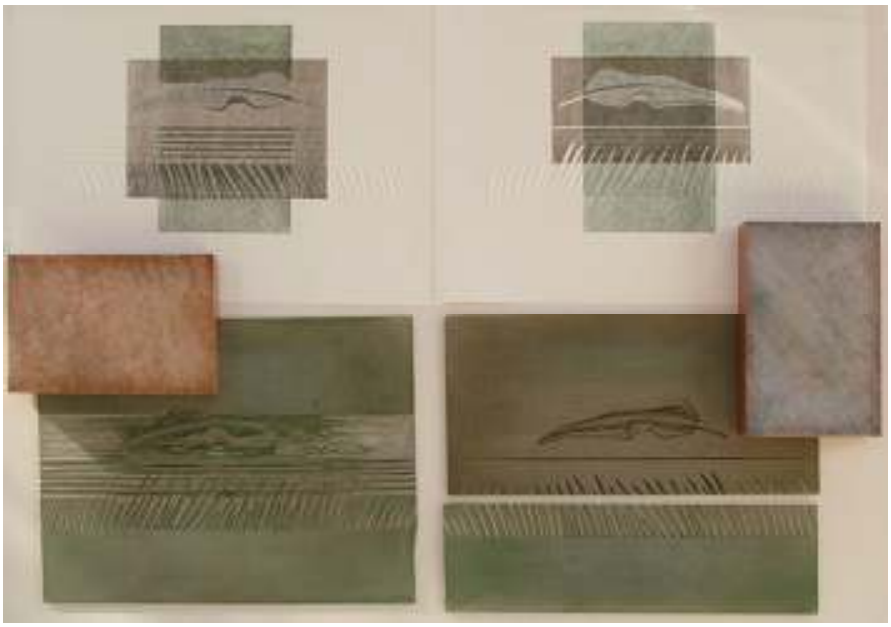

Fig 6:9 *Gum Leaf Left and Right*: prints and blocks.

The continued development of maculature and offset is exemplified in the pair of prints *Gum Leaf Left and Right* (**Fig 6:9** p.153). The impetus for their configuration demonstrated that the Modular System was an effective tool for responding to the demands of printmaking. The actual transfer, offsetting and maculature processes informed the work for an exhibition undertaken at stage IV that addressed Australian ex-patriotism in Britain. For *In a Different Light* our trio of ex-patriot printmakers agreed that our transposition into a world of different light and colour had influenced our artistic output.[1]

Working with transferred pairs of prints presented me with the idea that the actual act of transferring and offset printing could be a metaphor for the predicament of living in different weather and within a different culture that had nevertheless influenced its former colony: a double offset exchange. An additional irony is that the imagery of the paired prints was not so very different.

For *Gum Leaf Left and Right*, two tint blocks and linocuts were used with two different embossing foams. Each tint block was inked and offset onto a linocut. Only the top half of the right linoleum that is split in half was used for offset. Each print consists of an overprint of a tint block and a linoleum offset. After the offsets from the tint blocks were printed, both linocuts were printed and embossed simultaneously, each with a different area of bas-relief. The halved linocut was re-assembled only for embossing *Gum Leaf Right*. These images represent the last refinement of embossing in the project. They also show the ascendancy of maculature as a process and the increasing importance of offsetting. While the graphic re- interpretation of imagery from offsetting was explored with *Addon*, *Gum Leaf Left and Right* are the first prints to be designed and devised specifically to exploit the reversal and tonal inversion arising from offsetting.

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[1] *In A Different Light*: three Australian printmakers living in Britain: Katie Clemson, Edwina Ellis and Karyn White: Bankside Gallery, November 2007.

Stage V Growth

The culmination of the research project at Stage V is marked by exponential growth where every additional innovation indicated further potential for exploration with the Modular System and in diverse directions.

The interrelating of printing surfaces and furniture outlined in Chapter 4 occurred mainly at this stage and larger and more disparately shaped tint blocks were added. Laser engraving acetal resin furnished a new supply source for tint blocks that particularly expedited the growth of the Modular System. Experiments with laser involved both furniture and printing surfaces. Laser cut steel circular chases enabled the specific line direction of the tint blocks to vary and facilitated the inclusion of differently sized and shaped blocks. The adaptations made to the compound matrices using vinyl and magnetic sheet facilitated the exploration of imagery reversal arising from the continuing investigation of offsetting and transferring processes.

The growth of the Modular System tint blocks was literal. Larger tint blocks span the template size with a 12mm margin that supplies the potential to offset onto any of this area (**Fig 6:8e** p.153). Laser engraving is beginning to provide an efficient alternative to hand engraving these optimum sized tint blocks, that otherwise present a long and tedious hand engraving prospect. The increasingly varied demands of imagery generated by the Modular System continue to furnish extra tint blocks. The small 85mm diameter red circle that can be seen in the *Changing Trends* proofs was a spare sample extrusion of acetal resin(**Fig 6:11a** p.157). It was engraved specifically for these two prints which are offsets from new 126mm square tint blocks. The circular chases hold the increased variety of tint blocks as well as rotating them to any angle.

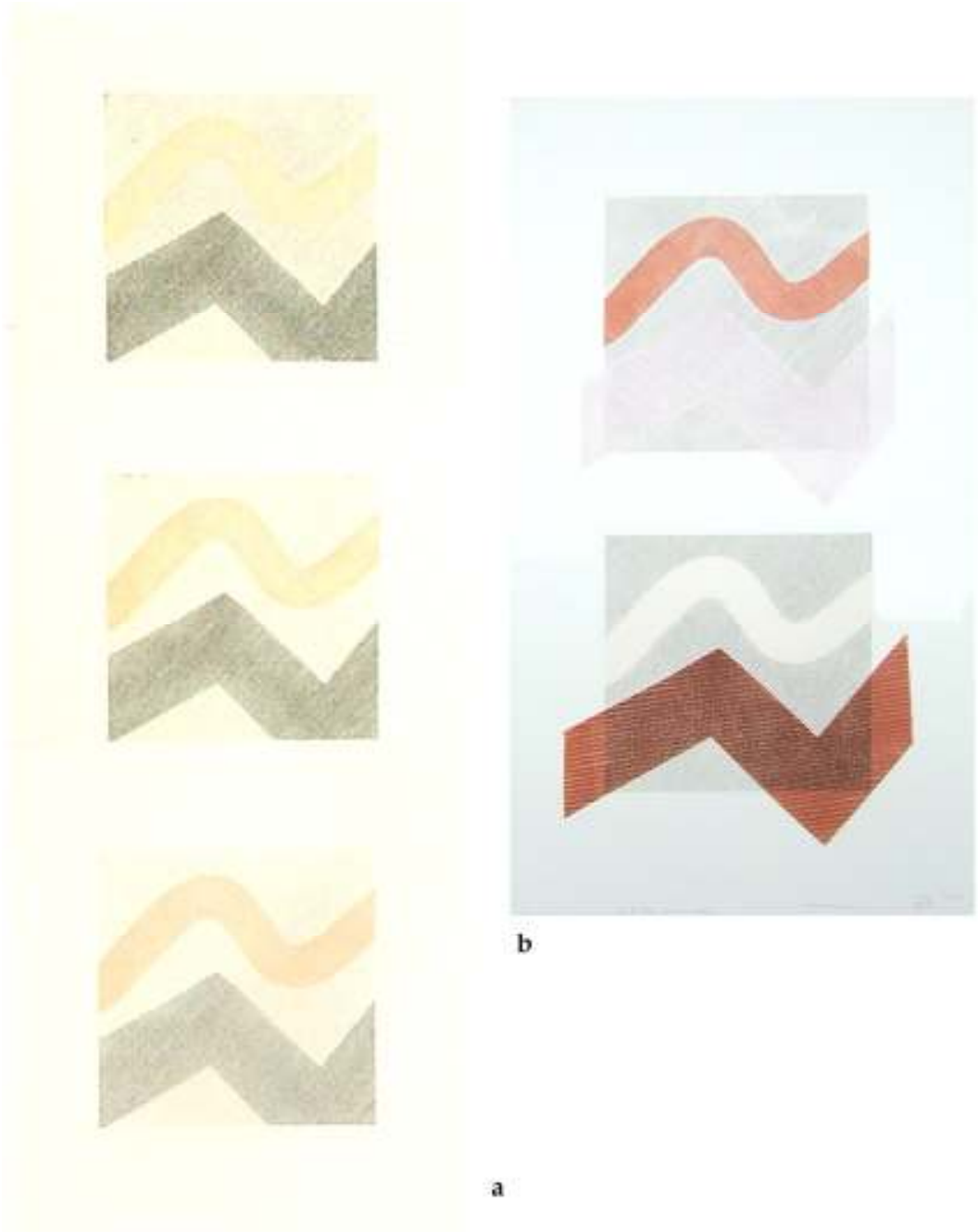

Fig 6:10 *Changing Trends*: **a**) collage from three maculatures of the third proof state
b) Collage from *Trends 2* & *Trends 8* using an inked lino offset onto large tint block

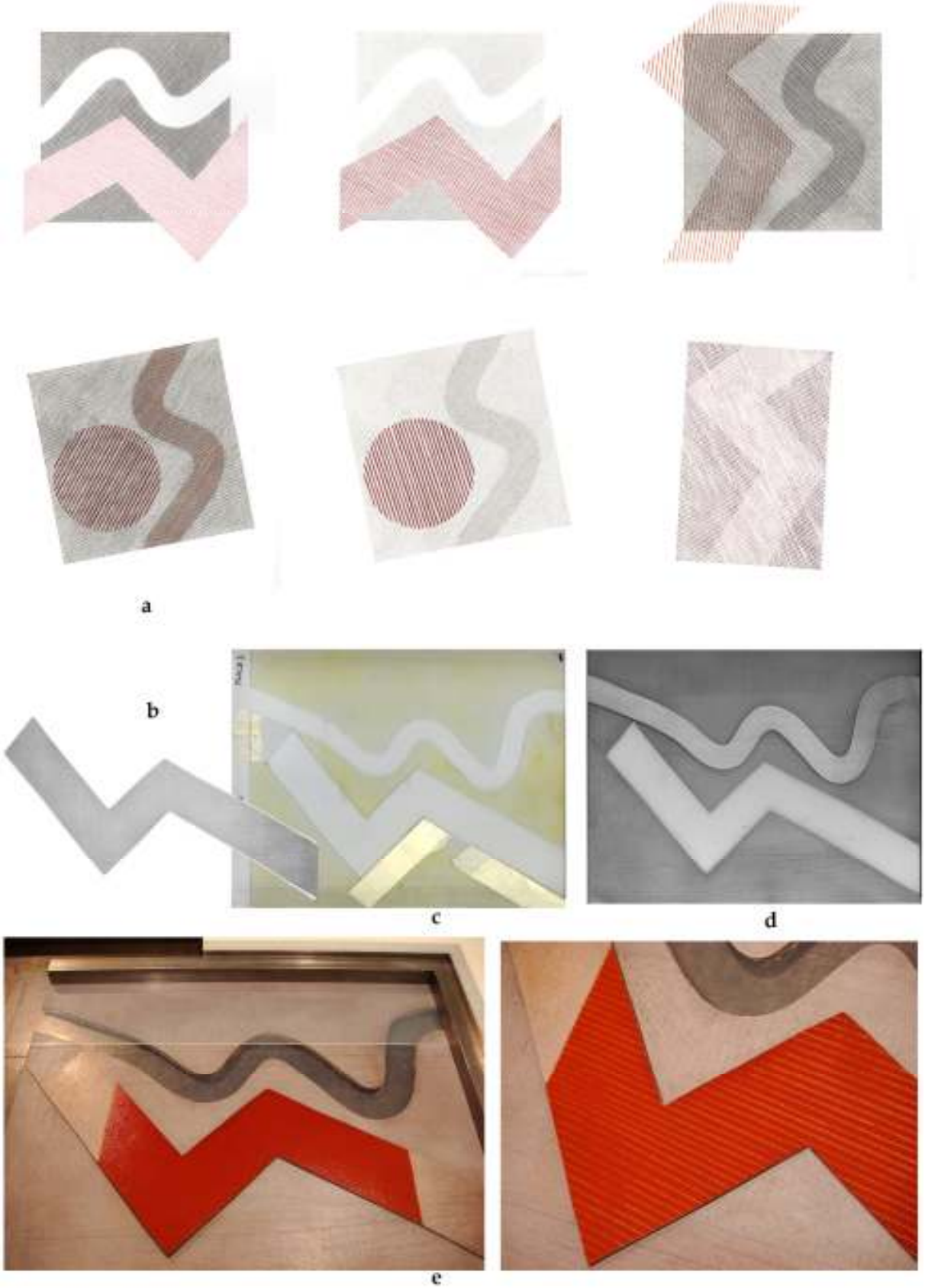

Fig 6:11 *Trends* **a**) proofs prints, **b**) sharp trend component, **c**) holding compound matrix, **d**) *Trends* compound matrix, **e**) inking lino for a reverse image. Used in the top right proof and in the collage **Fig 6:10b**

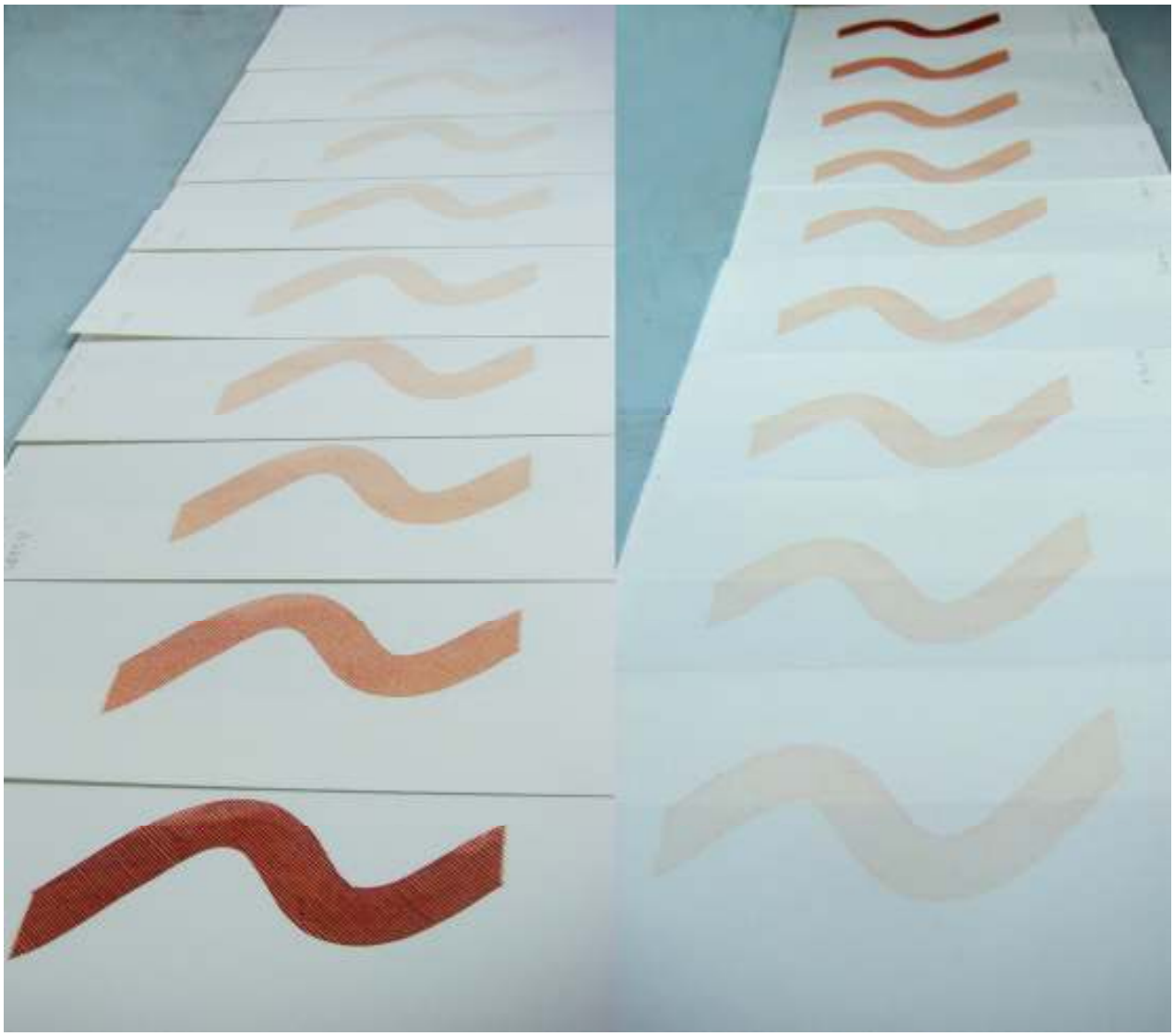

Fig 6:12 Maculature ink trials turn into plans for a series of prints. *Flowing Trends* and intaglio red ochre ink

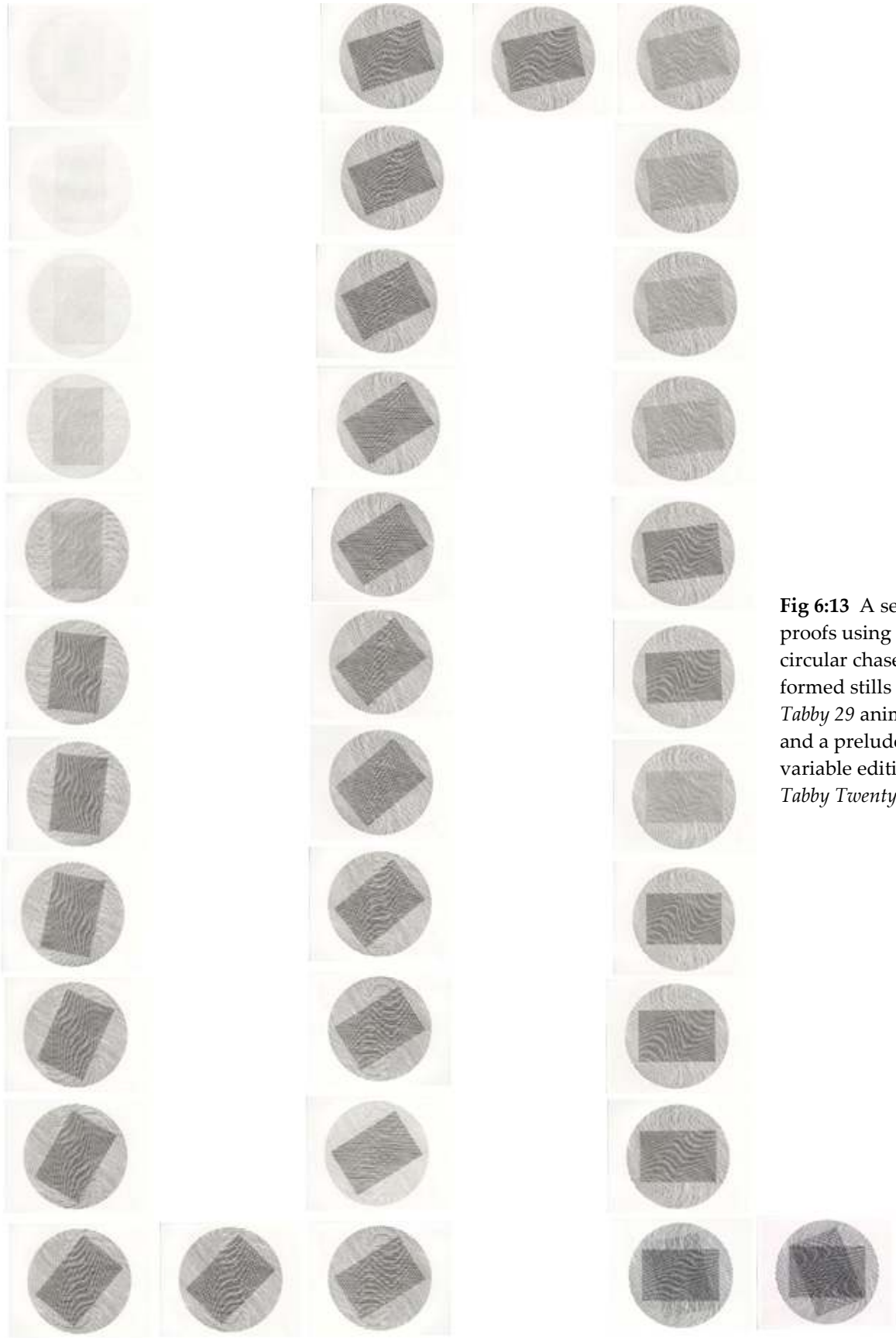

Fig 6:13 A series of proofs using circular chases that formed stills for *Tabby 29* animation and a prelude to the variable edition *Tabby Twenty Nines*

The growth of application for offsetting and maculature processes is exemplified in the *Changing Trends* series of proofs (**Figs 6:10** and **6:11** pp.156–7). A collage from three progressive maculatures (**Fig 6:10a** p.156) was composed from the third of eight viable results from a single proofing session with the new *Trends* compound matrix (**Fig 6:11d** p.157). Each additional inking supplied a viable offset pair: and the image changed rapidly depending on which of the three elements shown at **Figs 6:11b**, **6:11c** and **6:11d** were printed, offset or inserted into the compound matrix. The finished prints and one pink *Sharp Trend* offset left for future consideration are seen at **Fig 6:11a**.

In the second collage from the same proofing, the historical precedence of the Mentz Psalter had a direct influence on the inking of the deep red *Sharp Trend* in the lower proof (**Fig 6:10b** p.156). The *Trend* smooth component was masked and the linoleum was inked instead of the tint block (**Fig 6:11e**p.157). Offset *onto* a large tint block 28, the *Sharp Trend* component conveyed a reversed image and enabled a number of *Changing Trends* proofed versions to be overprinted that would otherwise have been in reverse. A future application of the Psalter strategy could involve two differently inked components offset onto a tint block for simultaneous two colour printing from a single tint block**.**

Historical research into reasons for the dearth of colour in early printing provided guidance for ink trials that were run to establish the best inks for offsetting and maculature. For a high tonal contrast between the un-printed and the maculature areas of an offset, the ink must transfer in sufficient quantity from one printing surface to another. The use of lamp black, or carbon, for printing ink was one of the earliest ink ingredients and has endured to the present day. Although the qualities of carbon based printing ink were investigated in order to answer the historical question of its enduring success, the research informed this technical side of the practical work. An understanding of why the phenomenon had been observed, and what measures to take to maximise what was chronicled as the minor disaster of *set-off*, was gained from investigations destined only to

ask the historical questions. Stiff letterpress or lithographic inks are designed *not* to set off and the trials established that intaglio ink (judiciously rolled) was more effective for printing offsets. Maculature trials are ongoing, with a maculature run generally made of any new ink – which effectively cleans the block in wood engraving tradition. The outcome depends on whether dry or wet paper is used, but in general the 'fade' characteristics for maculature appear to be as variable as the pigments that supply their colour – but that a longer gradation is obtained from letterpress and lithographic ink, and on dry paper.

Numbered fading maculature trials spawned a future plan for the Modular System. The *Trends* maculature run in **Fig 6:12** (p.158) is with intaglio red ochre – a coarse grained ink that has provided the longest viable run so far. It is visible in the *Trends* collages, variously as a red, orange and apricot *Flowing Trend* (**Fig 6:10** p.156). The run has been photographed to configure a future compound series with replaceable parts which would produce print runs of different fading in variant places. The proofs from such a compound matrix could form a series of animation stills, building on the early application of maculature fade for the *Tabby 29* animation (**Fig 6:13** p.159). This also demonstrates the growth of applications for the circular chases.

In addition to generating interference figures, the chases enable the tint blocks to *avoid* a moiré and they effectively multiply the bank of linear tone by enabling all tint blocks to overprint themselves, in similar manner to Papillon and Bewick's concept of cross hatching. *Double Crosspatch* (**Fig 6:14e** p.163) was planned to build up cross hatched tone by turning a number of blocks in *kentōban* and circular chases and offsetting them onto the same *Meander Grander* pair of positive and negative large linocuts (**Figs 6:14c –d**). Each step of this proofing produced offset imagery on the tint blocks. Overprinted in various configurations, they also formed a small variable series of five *Crosspatch Aftermaths*. The version at **Fig 6:14b** utilised the smaller blocks shown at **Fig 6:14a.** The operation demonstrated a growing dilemma with the Modular System. Whatever goal is in sight for

any printmaking plan, the residual and unexpected offsets take the procedure in the opposite direction. It is difficult to follow both routes offered by these paths at once, and although it possibly can produce a series of proofs as in *Changing Trends*, it is usually less confusing to deal with one direction at a time. The consequent tension between planning and spontaneity appears to be an intrinsic aspect of printmaking with offset imagery.

The *Crosspatches* involved new press furniture in the circular chases and steel *kentōban*, the implementation of new blocks and the exploitation of laser engraving. The *Meander Grander* large linocuts used with *Crosspatches* were specifically configured for the largest circular tint blocks and circular chases also developed at this stage. (The drawing is shown in Chapter 4 **Fig 4:7c** p.112). They are the penultimate manifestation of the *Meander* motif that has followed every development of the Modular System from the earliest experiments (detailed in Chapter 3 **Fig 3:12** p.61) and which at this stage formed the basis for proofing new large laser engraved acetal resin blocks (**Fig 3:4b** p.68).

Laser cutting (as opposed to laser engraving) had been used for the steel furniture and chases – by proxy: the ordered and signed pfd files emailed to an engineering shop. Thinner 8mm acetal resin plate has been cut by Tom Sowden at the University of West England Centre for Fine Print Research for *Meander Macro*, a set of compound plates. Those shown at **Figs 6:15a** and **6:15b** (p.165) include thinner (green and blue) perspex versions cut for holding compounds. As these were all laser cut following the same vector lines, they form both printing surfaces and registration devices – and the acetal resin could be engraved. *Meander Macro* plates are blurring the boundaries. Their future is unclear – other than that they are already viable components of the Modular System. The little squares fit into an *Addon* compound matrix (**Fig 6:15a** p.165).This development typifies the exponential burgeoning of applications for the system. The devices are reconciled with the Modular System in two ways: by using early components – thus also demonstrating their viability, and by the use of new materials and furniture.

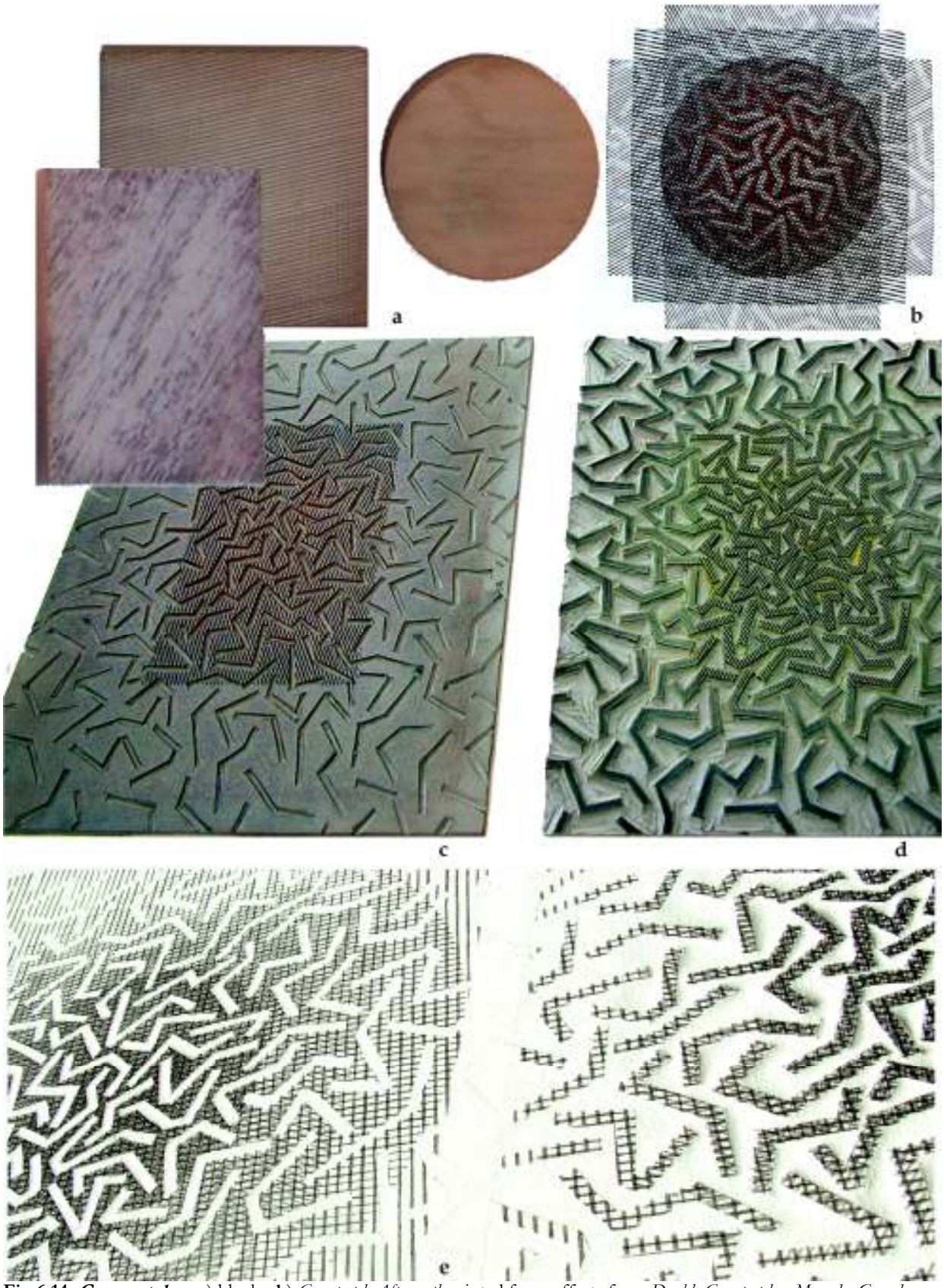

Fig 6:14 ***Crosspatches***: **a**) blocks, **b**) *Crosspatch Aftermath* printed from offsets from *Double Crosspatch*. *Meander Grander* linocuts: **c**) negative, **d**) positive, **e**) *Double Crosspatch*. **p.164**

The latter include the new steel *kentōban* designed to be compatible with the circular chases and a magnetic mat inner *kentōban* that centres what are now called *plates* to differentiate them from type height (**Figs 6:15e, 6:15f** p.165). The growth of applications for laser cutting includes further configurations for printing from engraved furniture and chases – and possible compound plates with moving parts. The Tecaform AH acetal resin sample used for *Meander Macro* has enhanced sliding properties for the commercial fabrication of moving parts. Thus laser cutting through thinner material may identify successful ways of fabricating chases and furniture which could incorporate calibrations or linear engraving for printing – engraved by the same laser nozzle, and in a single simultaneous engraving and cutting laser session.

Laser engraving has been combined with hand cutting for the *Curly Journey* tint block (**Fig 6:16** p.166). The idea was to make a tint block that could be gradually lightened in various configurations in the reduction linocut tradition established by Picasso. A laser engraved block (**Fig 6:16f**) was offset printed in its steel *kentōban* positioned over a *Curly Journey Path* strip: the offset is just visible (**Fig 6:16a**). Every second line is being engraved out around the offset path (**Fig 6:16g**). The paradox of a repeatable tint ground with an occasionally specific narrative function has indicated possibilities to incorporate more traditionally narrative applications of wood engraving. The *Curly Journey* components additionally show the growth of applications for vinyl and magnetic mat. The central path component from *Curly Journey* (**Fig 6:16a**) is fixed to the dark magnetic mat that replicates a *Curly Journey* compound matrix (**Fig 6:16b**). It grips a steel template-sized underlay accurately cut by laser. Some steel underlays have been cut, as here, 12mm wider and longer to enable steel strips to adhere to the magnetic mat and act as butts to keep segmented vinyl parts in place. The 12mm steel margin is just visible (**Fig 6:16c**). The *Curly Journey* acetal block is registered with the square steel kentōban (**Fig 6:16d**). The magnetic mat angle seen partly covering the original steel *kentōban* has been invaluable for changing the paper margin easily(**Fig 6:16e**).

Fig 6:15 *Meander Macro* and laser cutting**:**
a) *Addonto* compound matrix holding *Meander Macro* 4mm perspex for holding compounds
b) *Meander Macro* 8mm acetal resin compound plates
c) laser engraved acetal resin tint block
d) magnetic 0.5 mm strips build sides of blocks that are too thin
e) laser cut steel *kentōban* centres 127mm tint blocks

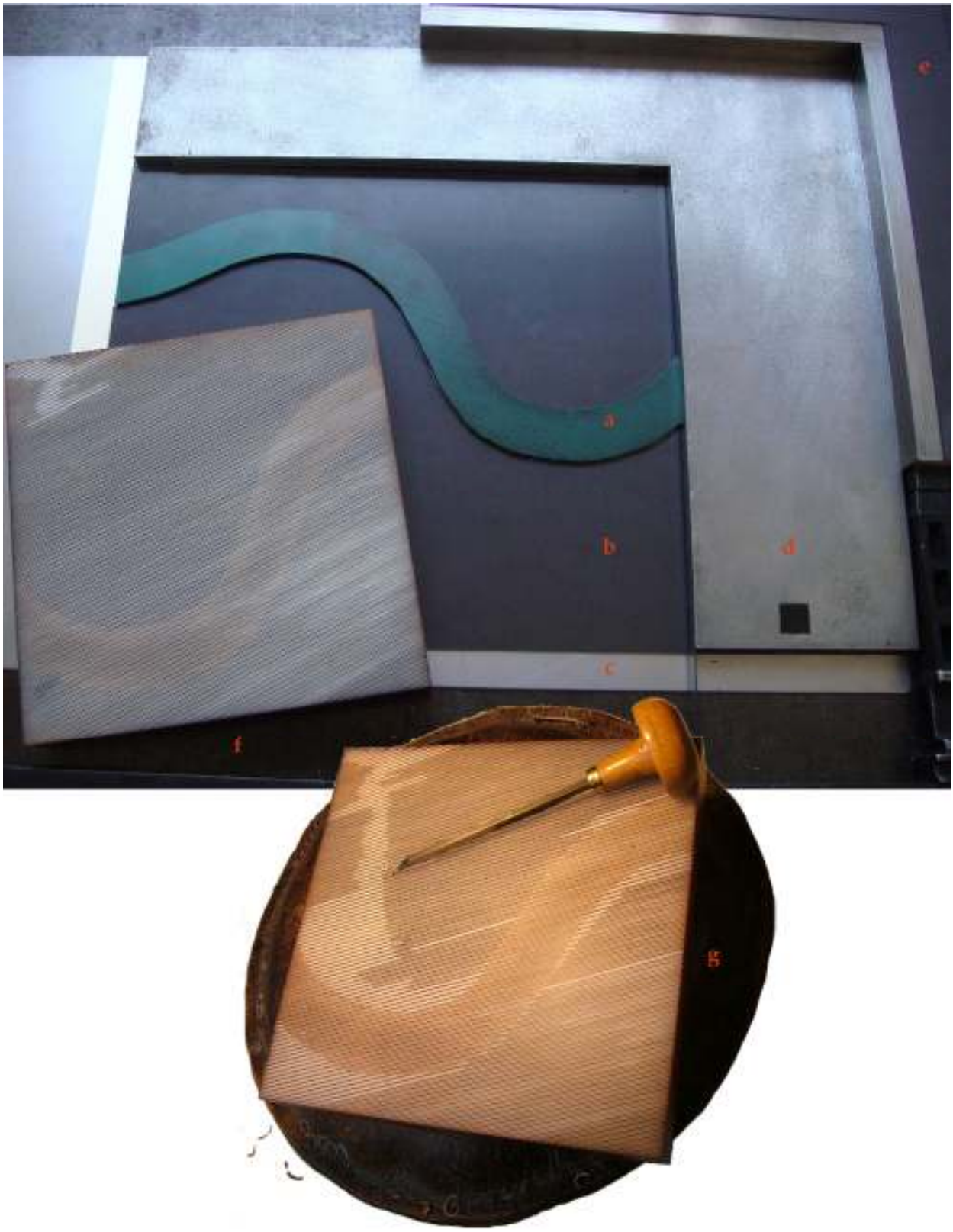

Fig 6:16a-g *Curly Journey* laser and hand engraved acetal resin, laser cut steel, vinyl and magnetic mat

The potential of steel in the Modular System lies with its combination with magnetic mat, which is poised to convert furniture and chases into printing surfaces. The same digital files that laser cut along vector lines into acetal resin could be used to cut thin steel plate compound matrices or stencils. The circular chase lines could also be cut or copied onto thinner steel. The rigidity of steel would effectively form a template for cutting magnetic mat to grip its surface and interchange with the system. Experimental cutting with hollow tools into 0.8mm magnetic mat has indicated that it too may be textured and its flexibility enables offsetting onto rigid surfaces. The shallow depth that would render it unviable for relief printing does not affect offsetting from tint blocks or vinyl as the second printing substrate only touches the surface. The mat could be used in conjunction with laser cut steel compound matrices. A subsequent thin but flexible surface was identified in solar plates and a putative investigation revealed its potential to provide an instant reversed version of a large linocut or vinyl-cut. This could be accomplished by a developing a turned over acetate proof on the solar plate. As solar plates grip magnetic mat (it was originally adapted for printmaking with solar plates), they could form part of the plan.

The introduction of magnetic mat is the direct result of using vinyl in the Modular System. With *Alberslines*, the potential burgeoned for a material with a sympathetic offsetting surface that is printable on both sides and is easy to cut accurately (**Fig 6:17**p.168). The variations of *Alberslines* vinyls show how the material was accurately replicated by extremely clear offset prints (**Fig 6:17a**). As the jigsaw pieces shown fit together with no tolerance gap at all, the unsuitability of vinyl for laser cutting is irrelevant. Simultaneous two colour printing from a single tint block offset onto vinyl could show an extremely fine transition from the two colours.

All of the *Alberslines* vinyls in **Fig 6:17** make an important technical point: the blue surfaces have the same orientation, and the green surfaces likewise. The colour coding of

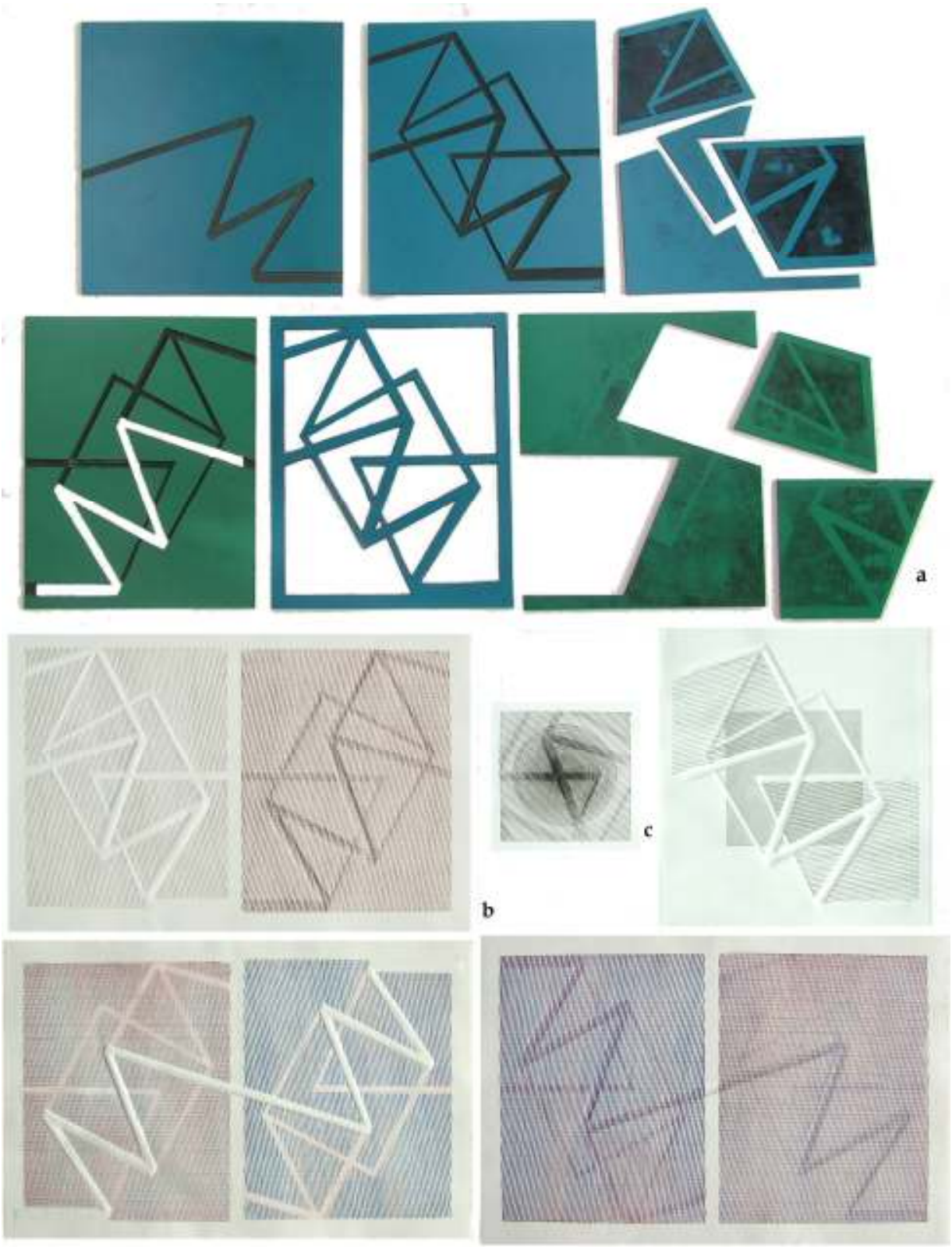

Fig 6:17 Growth of reversibility enhanced by the use of vinyl: **a**) *Alberslines* vinyl Compound Matrices, **b**) Prints from from *Alberslines* vinyl, **c**) an offset print, facilitated by turning cut-through vinyl over.

the obverse and reverse versions of a series of compound matrices has an importance in the Modular System that cannot be underestimated.

At the planning stage, deciphering where and how an offset was produced is deceptively difficult without clear signposts. In the failure corner of the research project is a two-inch pile of *Gumleaf* linocuts to prove how confusing and disorienting it can be to plan with printing surfaces and printed offsets – even with their registration corners clearly marked. Dealing with a reversed *Gumleaf* linocut when it appeared to obverse itself on the sly became so dementing that it was abandoned. Being able to cut green first and only turn over – literally, or onto subsequent vinyl surfaces – is little short of a godsend. The addition of blue and green sticky spots to the registration corners of proofs from vinyl has also contributed to reducing the technical intrusions to such an extent that the *Alberslines* printing surfaces could actually become more complicated. As the separated bits of jigsawed *Alberslines* may show, colour coding has enabled odd, literally puzzling and time wasting pieces to join the series. This has stretched the interpretations of a graphic device that was originally inspired by the interpretative ambivalence of Joseph Alber's linocuts. It is aided by the dark vinyl core and the fact that cutting vinyl is not black and white. As the cutting process takes not very much longer than making a drawing, working with vinyl could become drawing. It was the stencilled version of *Alberslines* that gave rise to the ideas of steel and other more rigid versions and with the use of magnetic mats: these could also be replicated in acetal plate. The attraction of this plan also lies with the use of vinyl to offset – and the fact that vinyl can be incised for linear tone. It was at this stage of the applications for vinyl that the copper plates from my MA study were cut down in readiness for offsetting with vinyl (**Fig 2:1a** p.25: the prints at **Fig 2:1b** are larger). The stencil was easy to place and position accurately for verso printing and has an additional role with drawing and planning, where it literally becomes a stencil. Thus it is vinyl and its implications for future applications that is sending the Modular System off in a number of different directions.

A Curly Journey

One of the last works printed for the 'Planned Spontaneity' exhibition symbolises the journey taken with the construction of the Modular System. *Curly Journey Overnight* on page 174 **Fig 7:1a** brings the exploration full circle. Its planning and production exemplify the changes wrought by the research project on my working practices and processes. It is becoming clear that the Modular System as an entity more resembles a station and the journey taken one of many possible routes. The concepts and processes have already departed in the hands of other printmakers whose reactions and input are informing my next travel plans.

The name of the print identifies its origin in the use of particular compound printing matrices called *Curly Journey* that were planned and cut in odd periods snatched from writing. *Overnight* refers to its dark and light sides and to its orientation. The dark side is specifically on top if hanging portrait and to the left for landscape. The original *Curly Journey* compound matrix was drawn directly onto an abandoned compound linoleum matrix experiment. The inspiration for a large sulcated snake came from *Pole 1*, a proof from the early developmental Stage II in the project (seen in **Fig 5:6** page 125). The impetus for the specific *Curly Journey Overnight* print came from a blind-embossed proof of this original linoleum matrix, which instigated a single evening of cutting a reverse *Curly Journey* in vinyl. After an offsetting trial, planning involved standing at the press calculating how to gang up and rotate the related pair of offsets, protect protruding paper from greasy Albion parts, and running blind and translucent proofs through the procedures noted down. The dossier of proofs and list of successful manoeuvres that emerged enabled an edition of six prints to be run off in a combined inking and embossing session, during an evening off from thesis-writing. The resulting print, *Curly Journey Overnight*, represents a journey to the outer limits of the capabilities of the Modular System, taking it to its maximum pressure and paper area with the equipment in hand. Along with the Albion press, this included the furthest extent of my mathematical acumen. However, in the return to the origins of the Modular System for

inspiration, the journey becomes circular, the print signalling a possible future return to a more conventional relief engraving scale – but with different baggage.

The making of *Curly Journey Overnight* demonstrates how far printing has moved into an inaugural role in the relief engraving process, evolving into a means for creating prints that are still nevertheless couched in the traditional methods of engraving and linocutting. One of the most exciting aspects of the research project was the realisation that working with the Modular System was expediting the journey of ideas into prints. This is a particular sea-change after a long career scattered with unresolved ideas discarded as unsuitable to the relief engraving medium. Decades-old inspirations and new whims were acted upon – and in *Curly Journey Overnight*, the inspiration sprang from an enduring fascination with the play of light on sulcated surfaces such as corrugated iron. Not only does the Modular System facilitate a quick response to stimuli but also little graphic impetus is discarded as unsuitable. The use of failed linoleum that survives as the embossing block for half of the *Curly Journey Overnight* indicates how far this ongoing viability extends to the physical components of the Modular System.

In contrast to the singular and narrative functions of tonal engraving in my previous practice, *Curly Journey Overnight* demonstrates that printing surfaces are no longer exclusive or single-use: their fabrication is an investment in future works. The single tint block employed is ready for application to numerous future prints – it remains a favourite and much-used block. A laser-engraved square that has been configured further with hand tools to reflect the centre of the journey (seen in **Fig 6:16g** on page 166) and the magnetic mat that has replicated each part of the compound matrix (in **Fig 4:4** on page 103) both have a multiplicity of applications for future prints using the same *Curly Journey* compound matrices. The deep embossing into thick damp paper with archival foam and brushes involves new treatments and new materials.

The demands of formal research have had a positive impact on both the development of the Modular System and my sense of historical perspective as a printmaker. Phrases that might have previously passed unnoticed suddenly took on significance. Reading Pi Sheng's delight in a 'marvellously quick' process that he could easily clean, established an identification through printing history with a millennium of jobbers: Moxon and his 'faint and foul' but cheap red-lead ink, Savage's satisfaction in discovering that 'engravers on wood' agreed that the plan he adopted was the most accurate for 'a re-impression' by the offset transfer process he had devised by himself.[1]

Keeping detailed notes on printing procedures throughout the project was not laborious but an innovation for my printing studio and made a substantial contribution to the development of the Modular System: even the creator of a new system has to learn it. Notes and printing schedules enabled a steady progression through what would have otherwise been random blundering. They were necessary in order to perfect a fundamental simplicity of process. The unpredictable results achieved with reverse prints and unplanned offsets encourage further exploration. The element of surprise remains an intrinsic aspect of the process because it is difficult to think graphically in opposite directions without compromising one of them. Although some explorations lead to dead ends, the Modular System makes it easier to abandon a direction and head for a different view, armed only with a piece of vinyl and a scalpel blade.

During the PhD project, naming became an amusing yet important element. As prints often evolve from *printing*, it has proved expedient to identify their provenance in order to build on previous procedures. Identification of what surfaces were used to offset and whether a print was a series of variations or an identical edition was important for repetition and to acknowledge happy accidents. *Chevreul Colours* are a diverse collection

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[1] Carter, T. F. and L. C. Goodrich (1955). The Invention of Printing in China and its Spread Westward. New York, Ronald Press Co. p.212.
Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications. p.300.
Savage, W. (1822). Practical Hints on Decorative Printing. London. p.61.

of prints with colour contrast, *Tabby Twenty Nines* vary over 29 configurations with the same blocks. The most important element was to identify whether an image was reversed or from a residual offset. To the *Contracrossples* and *Backwards Trends* was added *Aftermaths*. Names of plates and matrices stay about the studio with their constant re-use, where they are honed alliterated and rhymed in a habit gained from the necessary note-taking of formal research.

One of the rewards of travelling is the encounters one makes en route. Two experienced printmakers, Wuon-Gean Ho and Gini Wade, joined me for an intensive day in the studio designed to introduce them to the Modular System and to determine how far or whether any of its developments were transferable. In demonstrating my own methods with the Modular System, I noted that both printmakers progressed from initial bewilderment in comprehending the outcomes from offset transfer between two printing surfaces to an enthusiastic grasp of the possibilities for their work and of the simplicity of the process. The difficulty of understanding the process, although momentary, appears to spring from its lack of resemblance to the familiar and traditional printing methods to which it is closely related. I encouraged Gini and Wuon-Gean to try offsetting a printing surface they had already prepared and printed. Familiarity with the image from both these perspectives assisted their comprehension of the extent of the re-interpretation wrought by offsetting.

Both printmakers are familiar with working in either white line for relief or black line for intaglio and they consciously chose graphic imagery with specific treatment for their proofs (**Fig 7:1** p.174). Gini Wade's *Skeleton* is black line intaglio on a zinc plate (**Figs 7:1e-f**); Wuon-Gean Ho's *Mask* is cut white line on vinyl (**Figs 7:1b-d**). Wuon-Gean pioneered the general use of vinyl in Britain. In addition to exploiting both black and white line on vinyl, she also employs plate-wiping techniques usually associated with intaglio plates. From her first print, Wuon-Gean incorporated wiping techniques with offsetting (**Fig 7:1b** p.174). I was interested to observe how both printmakers applied the concept for

Fig 7:1 The Curly Journey: **a** C*urly Journey Overnight*, **b** Wuon-Gean Ho *Mask*: wiped vinyl, **c** print from oblong tint blocks offset from vinyl, **d** print from vinyl offset with oblong tint blocks **e–f** Gini Wade *Skeleton*: **e** zinc intaglio plate offset with vinyl, **f** vinyl offset with zinc intaglio relief.

representational graphic imagery: an area my own work is only very gradually approaching.

Gini Wade cut a simple linear vinyl to offset print onto her etched zinc *Skeleton* plate – which already had a dense linear tonal treatment. The zinc was relief printed and shows the darkest lines of the vinyl cut (**Fig 7:1e** p.174). The print taken from the vinyl side after inking the zinc shows white line vinyl cuts (**Fig 7:1f**). The ease of printing two thin plates together indicated that the incorporation of metal plates into the Modular System would greatly reduce technical work at the press by obviating the need to change between widely disparate printing heights such as between type high tint blocks and the flexible surfaces. It was in this area that the full implications of the use both printmakers made of the Modular System established a departure point for processes developed with it. This was the case both for them and for me. Wuon Gean's use of vinyl for tinting or linear tone established that my plans for steel and vinyl combinations could go further. She immediately made plans to cut her own vinyl tint blocks. Wuon-Gean uses vinyl as a drawing surface – her work methods are characterised by her immediate engagement with the printing surface to draw with her woodcutting tools. She immediately made a second vinyl surface for her *mask* print. Wuon Gean's attitude to cutting and preliminary work was illuminating and her cutting proved that vinyl could make linear tone and work as a flexible tint block onto rigid surfaces (**Fig 7:1c**). Wuon-Gean's wiping techniques, used in **Fig 71a**, are particularly adaptable to the easily smeared images offset from tint blocks and specifically used with vinyl.

Gini Wade's *Skeleton* metal plate solved a personal dilemma. The steel circular chases and *Kentōban* are displayed in the Planned Spontaneity exhibition to aid understanding of the developed processes. It was a difficult decision to bolt them to the wall for a number of weeks, leaving the studio bereft of key elements of the Modular System. The zinc plate engendered the idea of configuring steel *Curly Journeys* in two heights, which could

interact with magnetic mat that could be either linocut or left smooth. The varying heights would be raised or lowered on the same principle as Moxon's red letter printing.[2] The plans involve laser cutting a combined steel chase and compound matrix that will complete the integration of printing furniture and printing surfaces (**Fig 7:2** p.176).

The impetus coming from other artists who worked with the Modular System illustrates how one of the last boundaries is broken. Engraving previously took up so much time that there was little left for a rapport with other printmakers. The engraving block no longer confines the image and the surprise element, in addition to remaining inherent in the application of offsetting imagery, extends to the fact that there appears to be something to communicate.

Fig 7:2 Ongoing plans: for a laser-cut steel compound matrix and combined chase.

[2] Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick Exercises on the Whole Art of Printing (1683-4). New York, Dover Publications. p.299.

CHAPTER 1 INTRODUCTION

CHAPTER 2 THE MODULAR SYSTEM

CHAPTER 6 CONTINUATION AND GROWTH

CHAPTER 7 AFTERWORD

(1782). The Engraver's present, or, The pleasing instructor : containing easy lessons of one and two syllables ; decorated with many beautiful cuts. London, Printed and sold by John Marshall, at no. 4, Aldermary Church-Yard, in Bow-Lane, Cheapside.

(1825). Review of New Books:*The Annual Biography and Obituary of 1824*. The Literary Gazette and Journal of Belles Lettres, Arts, Sciences. &c. . London. **9**.

(1839). Review. *A Treatise on Wood Engraving; Historical and Practical. with upwards of 300 Illustrations, engraved on wood, by John Jackson. Knight and Co.* . The Magazine of Science, And Schools of Art **1:** 78 - 84.

(1839). Wood Engraving: *Resumed from page 84*

The Magazine of Science and School of Arts. **1:** 98-100 and cover illustrations.

(1858). Sabbath bells : chimed by the poets. London, Bell and Daldy.

(1962). A Dictionary of Printing Terms. London, Linotype and Machinery Ltd.

(2002). Redstone Diary 2002. London, Redstone Press.

Alexanderson, G. L. and L. F. Klosinski (1982). "On the Value of Mathematics (Books)." Mathematics Magazine **55**(2): 98-103.

Ames, W. (1937). "Chiaroscuro Woodcuts." Parnassus **9**(2): 4-8.

Andés, L. E., A. Morris, et al. (1903). Oil colours and printers' inks; a practical handbook treating of linseed oil, boiled oil, paints, artists' colours, lampblack and printers' inks, black and coloured. London; New York, Scott, Greenwood & co.; D. Van Nostrand co.

Andés, L. E. and H. B. Stocks (1918). Oil colours and printers' inks : a practical handbook treating of linseed oil, boiled oil, paints, artists' colours, lampblack and printers' inks, black and coloured. London, Scott, Greenwood.

Bain, I. and T. Bewick (1981). The watercolours and drawings of Thomas Bewick and his workshop apprentices. Cambridge, MA., MIT Press.

Baker (1895). Baker's Stencil Printing Process. Chipping Norton, Jno Baker, Chipping Norton, Oxon.

Ball, P. (2001). Bright earth : the invention of colour. London; New York, Viking.

Barker, D. (2005). Traditional techniques in contemporary Chinese printmaking. London, A & C Black.

Barker, D. (2009). Chinese Ink. E. Ellis. London.

Barker, D., G. Bankside, et al. (2006). Chen Qi : woodblock prints 1989-2002 = Chen Qi. [London], Muban Foundation.

Barr, R. a. J., J.K. (1892- 1901). The Idler 38 vols 1892-1901. London.

Bate, J. (1635). The mysteries of nature and art In foure severall parts. The first of water works. The second of fire works. The third of drawing, washing, limming, painting, and engraving. The fourth of sundry experiments. By Iohn Bate, [London] : Printed by [Thomas Harper] for Ralph Mabb.

Beaumont, R. (1890). Colour in woven design. London, Whittaker & Co.

Bewick, T. (1961). A memoir of Thomas Bewick written by himself. London, Cresset Press.

Blake, N. F. and W. Caxton (1969). Caxton and his world. (London:) Deutsch.

Bliss, D. P. (1964). A history of wood-engraving. London, Spring Books.

Blome, R. (1684). An essay to heraldry. London, Blome.

Bloy, C. H. (1967). A history of printing ink, balls and rollers, 1440-1850. Barnet (Herts.), Wynkyn de Worde Society.

Boorsch, S. and N. M. Orenstein (1997). "The Print in the North: The Age of Albrecht Durer and Lucas van Leyden." The Metropolitan Museum of Art Bulletin **54**(4): 1-60.

Bosse, A. (1645). De la manière de graver à l'eau forte et au burin, et de la gravure en manière noire ... Nouvel. Paris Charles-Antoine Jombert.

Bosse, A. (1758). De la maniere de graver à l'eau forte et au burin, et de la gravure en maniere noire ...Nouvelle édition ... Enrichie de vignettes, etc.. Paris.

Brett, S. (2000). Wood engraving : how to do it London, Primrose Hill Press.

Bridson, G. (1988). Colour Woodblock Techniques Benjamin Fawcett : Engraver and Colour Printer: with a list of his books and plates. . R. McLean. Aldershot, Scolar Press**:** 35 - 40.

Bridson, G. D. R. and G. Wakeman (1984). Printmaking & picture printing. Oxford, Plough ; Bookpress.

British, L. and K. B. Gardner (1993). Descriptive catalogue of Japanese books in the British Library printed before 1700. London; Tenri-shi, Japan, British Library ; Tenri Central Library.

Brittain, A. (1958). Engraving on Precious Metals, Wolpent & Manton

Brown, D. and D. Landau (1981). "A Counterproof Reworked by Perino del Vaga, and Other Derivations from a Parmigianino "Holy Family"." Master Drawings **19**(1): 18-79.

Brown, Y.-Y. (1988). Japanese book illustration. London; Wolfboro, N.H., British Library.

Buckland Wright, J. (1953). Etching and engraving : techniques and the modern trend by John Buckland-Wright. London, Studio Publications.

Burch, R. M. (1910). Colour Printing and Colour Printers. London, Pitman.

Burn, R. S. (1853). The illustrated London architectural, engineering, & mechanical drawing-book : for the use of schools, students, and artisans. London, Ingram, Cooke.

Campbell, C. (1990). The Beggarstaff posters : the work of James Pryde and William Nicholson Colin Campbell. London, Barrie & Jenkins.

Campbell, C. (1992). William Nicholson : the graphic work Colin Campbell. London, Barrie & Jenkins.

Cantor, J. E. (2004). Art in a Mirror: the Counterproofs of Mary Cassatt. New York, Adelson Galleries.

Carter, J., P. H. Muir, et al. (1967). Printing and the mind of man: a descriptive catalogue illustrating the impact of print on the evolution of Western civilization during five centuries. London; New York, Cassell; Holt, Rinehart & Winston.

Carter, T. F. and L. C. Goodrich (1955). The invention of printing in China and its spread westward. New York, Ronald Press Co.

Chaloner-Smith, J. (1884). The British Mezzotinto Portraits: Being a descriptive catalogue of these engravings from the introduction of the art to the present century:. London, H. Sotheran.

Chamberlain, W. (1978). The Thames and Hudson manual of wood engraving. London, Thames and Hudson.

Chamberlain, W. (1978). The Thames and Hudson manual of woodcut printmaking and related techniques. London, Thames & Hudson.

Chevreul, M. E. and J. Spanton (1857). The laws of contrast of colour and their application to the arts of painting, decoration of buildings, mosaic work, tapestry and carpet weaving, calico printing, dress, paper staining, printing, illumination, landscape and flower gardening, & c. London; New York, G. Routledge.

Chevreul, M. E. (1860). Principles of harmony and contrast of colours, and their applications to the arts. Spanton, J. Trans. London, Routledge, Warne and Routledge.

Chevreul, M. E., Faber-Birren (1987). The Principles of harmony and contrast of colors and their application to the arts : based of the first English edition of 1854 as translated from the first French edition of 1839.

Chevreul, M. E. and J. Spanton (1860). The laws of contrast and colour : and their application to the arts. London, Routledge.

Clark, H. and T. Wormull (1776). A short and easy introduction to heraldry : in which all the terms are displayed in a clear and alphabetical manner. London, Printed for G. Kearsly.

Clark, T. (2001). The dawn of the floating world, 1650-1765 : early ukiyo-e treasures from the Museum of Fine Arts, Boston. London, Royal Academy of Arts, Museum of Fine Arts, Boston

Clayton, M. and Leonardo. (2002). "Ten drawings by Leonardo da Vinci : a Golden Jubilee celebration."

Clouse, D. and A. Voulangas (2009). The handy book of artistic printing : a collection of letterpress examples, with specimens of type, ornament, corner fills, borders, twisters, wrinklers, and other freaks of fancy. New York, Princeton Architectural Press.

Clunas, C. (1997). Pictures and visuality in early modern China. London, Reaktion Books.

Clunes, J. A. P. a. E. (1933). The Art and Practice of Printing Vol 2 Letterpress Printing. London, New Era.

Colonna, F. and J. Godwin (1999). Hypnerotomachia Poliphili - The strife of love in a dream. London, Thames & Hudson.

Congreve, W. (1819). Principles on which it appears that a more perfect system of currency may be formed ... so as to produce a representative coin or token, the genuineness of which may be instantly determined by a separate gauge, or an intrinsic self-gauging coin, any counterfeit of which must be immediately detected. London, T. Egerton.

Congreve, W. (1820, 1820). "An analysis of the true principles of security against forgery exemplified by an enquiry into the sufficiency of the American plan for a new

bank note : with imitations of four of the most difficult specimens of those notes, made by ordinary means."

Coppel (1995). Linocuts of the Machine Age: Claude Flight and the Grosvenor School. London, Scolar Press.

Craig, E. b. (1968). Gordon Craig; the story of his life by Edward Craig. New York, Knopf.

Craig, E. G.-. (1924). Woodcuts, and some words. London & Toronto, J.M. Dent & Sons Ltd.

Craig, E. G. (1957). Index to the story of my days : some memoirs of Edward Gordon Craig, 1872-1907 by Edward Gordon Craig. London, Hulton.

Craig, E. G. and L. M. Newman (1989). Black figures : 105 reproductions with an unpublished essay Edward Gordon Craig; presented with introduction & documentation by L. M. Newman. Wellingborough, Skelton.

Crawhall, J. (1883). Crawhalls Chap-book Chaplets. London, Field and Tuer

Croy, P. (1998). Aubrey Beardsley. Primary Material: Book Subject(s): Beardsley, Aubrey, 1872-1898. Beardsley, Aubrey, 1872-1898 --Studies. Illustrators--Great Britain--Biography. London Victoria & Albert Museum

Curwen, H. (1949). Processes of graphic reproduction in printing. London, Faber & Faber.

Curwen, H. and C. Mayo (1963). Processes of graphic reproduction in printing. London, Faber and Faber.

Daniels, M. H. (1938). "Early Pattern Books Lace, Embroidery, and Woven Textiles: A Special Exhibition." The Metropolitan Museum of Art Bulletin **33**(3): 70-73.

Davis, B. H. (2008). William Savage's use of natural dyes in early nineteenth century printing inks.

Dawson, C. E. (1907). Lino-Cuts: A New Method in blockmaking for Posters and other Bold Work; also for making Tint-blocks for Two-Color. Wood-engraving and Poster-block Cutting. B. Leland. London, George Routledge and Sons.

Dibdin, T. F. (1814). Biblioteca Spenceriana vol I or A Descriptive Catalogue of the Books Printed in the fifteenth Century, and of Many Valuable first Editions, in the Library of George John Earl Spencer K G London, Shakespear Press: Longman, Hurst, Rees, & Co.; T. Payne;White & Cochrane; John Murray; J. & A. Arch.

Dibdin, T. F. (1814). Biblioteca Spenceriana vol II or A Descriptive Catalogue of the Books Printed in the fifteenth Century, and of Many Valuable first Editions, in the Library of George John Earl Spencer K G London, Shakespear Press: Longman, Hurst, Rees, & Co.; T. Payne;

White & Cochrane; John Murray; J. & A. Arch.

Dobson, A. (1879). William Hogarth, London : S. Low Marston Searle & Rivington

Dodgson, C. (1921). "Rare Woodcuts in the Ashmolean Museum, Oxford-II. Other Woodcuts by Burgkmair." The Burlington Magazine for Connoisseurs **39**(221): 68-75.

Dodgson, C. (1930). "Chiaroscuro Woodcuts." The Burlington Magazine for Connoisseurs **57**(332): 242-243.

Dossie, R. (1758). The Handmaid to the Arts London, J Nourse.

Durer, A. (1972). The Complete Engravings, Etchings and Drypoints of Albrecht Durer. London, Dover Publications.

Dyson, A. (1984). Pictures to print : the nineteenth-century engraving trade. London; Williamsburg, Va., Farrand Press.

Dyson, A. (2009). Printmakers' secrets, London : A&C Black Publishers.

Earhart, J. F. (1892). The color printer : a treatise on the use of colors in typographic printing. Cincinnati, Ohio, Earhart & Richardson.

Ellis, E. (1987). "A Moroccan Diary." Matrix No. 7 a review for printers & bibliophiles. : 16-18.

Emerson, W. (1881). Handbook of Wood Engraving with practical instructions in the art for persons wishing to learn without an instructor. Boston, Lea and Shephard.

Engleheart, N. B. (1840). Specimens of amateur printing. these specimens ... were effected by means of the ... press invented by Mr. Cowper and manufactured by Messrs. Holzapffel & Company. London, Printed by N.B. Engleheart.

Engleheart, N. B. (1852). A concise treatise on eccentric turning: to which are added practical observations on the uses of the eccentric cutting frame, the drilling frame, and the universal cutting frame. London, Pelham Richardson.

Evans, E. and R. McLean (1967). The reminiscences of Edmund Evans. Oxford, Clarendon Press.

Evelyn, J., C. F. Bell, et al. (1906). Evelyn's Sculptura : with the unpublished second part. [Oxford], Clarendon Press.

Faithorne, W. (1662). The Art of Graveing and Etching: wherein is expressed the true way of graveing in copper.Allso (sic) the manner & method of that famous Callot, & Mr Bosse in their several ways of etching. . London, Faithorne.

Ferne, J. (1586). The Blazon of Gentrie Deuided into two parts. The first named The Glorie of Generositie. The second, Lacyes Nobilitie. Comprehending discourses of Armes and of Gentry. Wherein is treated of the beginning, parts and degrees of Gentlenesse, vvith her lawes: Of the Bearing, and Blazon of Cote-armors: Of the Lawes of Armes, and of combats. At London, Printed by John VVindet, for Toby Cooke.

Field, R. S. (2005). Early Woodcuts, the Known and the Unknown. Origins of European printmaking : fifteenth-century woodcuts and their public. S. Parshall P, R. Washington, National Gallery of Art, in association with Yale University Press, New Haven: 19-35.

Firmin-Didot, A. and C. Vecellio (1863). Essai typographique et bibliographique sur l'histoire de la gravure sur bois. Paris, [Typographie de Firmin Didot Frer & Fils].

Fletcher, I. W. K. and A. Rood (1967). Edward Gordon Craig : a bibliography by Ifan Kyrle Fletcher and Arnold Rood. London, Society for Theatre Research.

Flight, C. (1934). The art and craft of lino cutting and printing. London, B.T. Batsford, ltd.

Franklin, C. (1980). Fond of printing : Gorden Craig as typographer & illustrator by Colin Franklin ; with a foreword by Edward Craig and an essay by Gordon Craig on illustrations in general. London, Hurtwood.

Friedman, J. M. (1978). Color printing in England, 1486-1870 : an exhibition, Yale Center for British Art, New Haven, 20 April to 25 June, 1978. [New Haven], Yale Center for British Art

Funcke, J. M., J. Mosley, et al. (1740, 1998). Kurtze Anleitung von Form- und Stahlschneiden. Darmstadt, Lehrdruckerei der Technischen University of Darmstadt.

Gamble, W. (1910). Modern Colour Processes. Colour Printing and Colour Printers. Londn, Pitman**:** 253-274.

Gascoigne, B. (1997). Milestones in colour printing, 1450-1850 : with a bibliography of Nelson prints. Cambridge, Cambridge University Press.

Glahn, R. V. (2005). The origins of paper money in China. The origins of value:the financial innovations that created modern capital markets W. N. Goetzmann and K. G. Rouwenhorst. Oxford; New York, Oxford University Press**:** 65 - 91.

Glaister, G. A. (1979). Glossary of the book. 1979. Glaister's glossary of the book : terms used in papermaking, printing, bookbinding and publishing with notes on illuminated manuscripts and private presses by Geoffrey Ashall Glaister. London, Allen and Unwin.

Goldman, P. and C. British Museum. Robin de Beaumont (1994). Victorian illustrated books : the heyday of engraving: the Robin de Beaumont Collection. Boston, D.R. Godine.

Gray, T. (1869). An elegy written in a country churchyard. London, Sampson Low, Son, and Marston.

Greenaway, K., S. Barker, et al. (1880). Kate Greenaway's birthday book for children. London; New York, George Routledge and Sons.

Greenland, M. (1997). "Compound Plate Printing: Security With Style." Printing Historical Society Bulletin **43**: 6-10.

Greenland, M. (2009). "Whiting and Branston's Lottery Printing." Journal of the Printing Historical Society **13**(New Series): 61 - 79.

Grenacher, F. (1970). "The Woodcut Map. A Form-Cutter of Maps Wanders Through Europe in the First Quarter of the Sixteenth Century." Imago Mundi **24**: 31-41.

Griffiths, A. (2004). Prints and Printmaking, an introduction to the history and techniques. London, The British Museum Press

Gross, A. (1973). Etching, Engraving and Intaglio Printing. Oxford, Oxfor University Press

"Gomu: Japanese rubber board for personal seals." Retrieved 2009, from hoshinoinban.com/company/com _ 3.htm

Guillim, J. and F. Nower (1660). A display of heraldie: manifesting a more easie access to the knowledge therof then hath hitherto been published by any, through the benefit of method. London, Printed by T.R. for J. Blome.

Hackleman, C. W. (1924). Commercial engraving and printing. Indianapolis, Ind., Commercial Engraving Publishing Company.

Hailing, T. and W. Hailing (1877). "Hailing's circular." Hailing's circular.

Hansard, T. C. (1825). Typographia: an Historical Sketch of the Origin and Progress of the Art of Printing. London, Baldwin Cradock and Joy.

Hansard, T. C. (1842). Treatises on Printing and Type-Founding from the Seventh Edition of the Encyclopaedia Britannica. Edinburgh, Adam and Charles Black.

Hardy, A. R. B., John J (1986). The Jewelry Engravers Manual New York, Prentice Hall Press.

Harman, C. G. (2007). "Perkins, Bacon - the Company and its Work." 2009, from http://www.rpsl.org.uk/perkins_bacon/index.html#2.

Harris, E. M. (1967). Sir William Congreve and His compound Plate Printing

Hasper, W. (1835). Handbuch der buchdruckerkunst. Nach eigener erfahrung und unter zuziehung der werke von Brun, Fournier, Hansard, Johnson, Savage, Bodoni und TÃ¤ubel. Carlsruhe; Baden, D.R. Marx.

Hayter, S. W. (1966). New ways of gravure, Oxford U.P.

Herrick, T. P. (1914). Embossing, blocking and die-stamping : a practical guide to these processes. London, Raithby, Lawrence & Co.

Hesketh Hubbard, E. (1927). Colour block print making from linoleum blocks. Breamore, The Forest press.

Hewitt, V. H. and M. British The banker's art : studies in paper money, London, Trustees of the British Museum : British Museum Press.

Hind, A. M. (1907). "A Note on C. N. Cochin's Second Revision of Abraham Bosse's 'Traicte des Manieres de Graver'." The Burlington Magazine for Connoisseurs **11**(54): 390-391.

Hind, A. M. (1909). "Engravings and Their States-I." The Burlington Magazine for Connoisseurs **15**(73): 25-30.

Hind, A. M. (1935). An introduction to a history of woodcut : with a detailed survey of work done in the fifteenth century, Dover reprint.

Hind, A. M. (1963). A history of engraving and etching from the 15th Century to the year 1914 : being the third and fully revised edition of "A short history of engraving and etching. New York, Dover

Hodgson, T. (1820). An Essay on Stereotype Printing; Including a Description of the Various Processes Newcastle, S Hodgson.

Hodson, J. S. (1884). An historical and practical guide to art illustration in connection with books, periodicals and general decorations : with numerous specimens of the various methods. London.

Holtzapffel, Co, et al. (1971). Charles Holtzapffel's Printing apparatus for the use of amateurs. [Pinner, Eng.], Private Libraries Association.

Hope, A. (1882). Manual of wood engraving for the amateur. Chicago, Colegrave Book Co.

Horne, T. H. (1814). An Introduction to the Study of Bibliography. London, T. Cadell and W. Davies.

Hoskins, S. (2004). Inks. London, A. & C. Black.

Houfe, S. (2002). Phil May : his life and work, 1864-1903 Aldershot Hants, Ashgate

Hudson, G. (2006). "Artistic Printing: a re-evaluation." Printing Historical Society **9** (New Series): 31 -63.

Hullmandel, C. J. (1833). The art of drawing on stone, giving a full explanation of the various styles, of the different methods to be employed to ensure success, and of the modes of correcting, as well as of the several causes of failure

London, Longman & Co. [etc.].

Hutton, C. (1788). A treatise on mensuration both in theory and practice. London, Robinson & Baldwin.

Hutton, C. and T. Bewick (1770). A treatise on mensuration, both in theory and practice. Newcastle upon Tyne, Printed by T. Saint for the author and for John Wilkie and Richard Baldwin.

Ibbetson, J. H. (1817). Specimens in eccentric circular turning : with practical instructions for producing corresponding pieces in that art. Illustrated by sixty copper-plate engravings and wood-cuts, referring to, and explaining the different figures to be executed. London.

Ibbetson, J. H. (1820). A practical view of an invention for the better protecting bank-notes against forgery. London, published by the author.

Ibbetson, J. H. (1838). Specimens in eccentric circular turning, with practical instructions for producing corresponding pieces in the art. London : Longman, [1835].

Ibbetson, J. H., Holtzapffel, et al. (1833). A brief account of Ibbetson's Geometric Chuck, manufactured by Holtzapffel & Co. : with a selection of specimens illustrative of some of its powers. London, Printed for the author, by A. Hancock ... sold by Holtzapffel and Co. ... and Stewart, ivory turner ...

Innes, C. D. (1983). Edward Gordon Craig Christopher Innes. Cambridge, Cambridge University Press.

International Printing Machinery and Allied Trades, E. and L. British Museum. King's (1963). Printing and the mind of man. [London, F.W. Bridges; obtainable from the British Museum.

International Printing Machinery and Allied Trades, E. and L. Windsor Castle. Royal (1980). Catalogue of exhibitions of British coloured books, 1738-1898 : including a selection from the Royal Library at Windsor graciously loaned by Her Majesty the Queen. London; Industrial & Trade Fairs, British Printing Machinery Association ;.

Ivins, W. M., Jr. (1917). "Exhibition of Italian Renaissance Woodcuts." The Metropolitan Museum of Art Bulletin **12**(11): 215-228.

Ivins, W. M., Jr. (1924). "An Early Picture of a Printing Press." The Metropolitan Museum of Art Bulletin **19**(2): 42-44.

Ivins, W. M., Jr. (1928). "Woodcuts in Chiaroscuro and Color: A Special Exhibition." The Metropolitan Museum of Art Bulletin **23**(3): 73-78.

Ivins, W. M., Jr. (1934). "Some Venetian Renaissance Woodcut Books." The Metropolitan Museum of Art Bulletin **29**(3): 46-50.

Ivins, W. M. (1953). Prints and Visual Communication. London, Routledge & K. Paul.

Ivins, W. M. and M. B. Cohn (1987). How prints look : photographs with commentary. Boston, Beacon Press.

Jackson, J. and W. A. Chatto (1839). A Treatise on Wood Engraving, Historical and Practical. London, Chas. Knight.

Jackson, J. B. (1754). An Essay on the Invention of Engraving and Printing in Chiaro Oscuro. Battersea.

Jackson, M. (1885). The pictorial press : its origin and progress ; with one hundred and fifty illustrations. London, Hurst and Blackett.

Jackson, W. A. C. a. J. (1861). A Treatise on Wood Engraving. London, Chatto and Windus.

Jacobi (1890). Printing; a practical treatise on the art of typography as applied more particularly to the printing of books.

Jerome, J. K. E. (1896). "In Arcades Ambo - The Beggarstaff Brothers at Home " The Idler. Edited by Jerome K Jerome and Robert Barr **No 8 August 1895 - January 1896**(Jan 1896): 519 - 528.

John Ruthven and, C. (1821). Concise account of lithography; or the art of printing from stone, with suitable directions. Ruthven's patent lithographic process. London, Printed by J. Stokes.

Joyner, G. (1895). Fine printing: its inception, development, and practice. London, Printed and published by Cooper and Budd.

Kainen, J. (1962). John Baptist Jackson: 18th-century master of the color woodcut. Washington, U.S. Govt. Print. Off.

Landau, D. and P. Parshall (1994). The Renaissance print : 1470-1550. New Haven; London, Yale University Press.

Laufer, B. (1931). Paper and printing in ancient China. Chicago, Caxton Club.

Le Blon, J. C. (1725). Coloritto, or, the harmony of colouring in painting : reduced to mechanical practice, under easy precepts and infallible rules, together with some colour'd figures, in order to render the said precepts and rules intelligible not only to painters, but even to all lovers of painting. London, s.n.

Lee, P. H. and W. T. De Bary (1997). Sources of Korean tradition. Vol. 1, From early times through the sixteenth century. New York ; Chichester, Columbia University Press.

Lehmann-Haupt, H. (1950). Peter Schoeffer of Gernsheim and Mainz; with a list of his surviving books and broadsides. Rochester, N.Y., Printing House of L. Hart.

Leland, C. G., T. Bolas, et al. (1907). Wood-engraving and Poster-block cutting London, George Routledge & Sons.

Lewis, C. T. C. (1911). The picture printer of the nineteenth century, George Baxter, 1804-1867. London, S. Low, Marston & Co.

Lewis, W. (1846). Chess for Beginners.

Lilien, O. M. (1985). Jacob Christoph Le Blon, 1667-1741 : inventor of three- and four colour printing. Stuttgart, A. Hiersemann.

Lowe, E. J. and W. Howard (1861). Beautiful leaved plants ... to which is added an extended catalogue. London.

Luo, S. (1999). An illustrated history of printing in ancient China. Hong Kong, City University of Hong Kong Press.

Mackenzie, A. D. (1953). The Bank of England note, a history of its printing. Cambridge UK, University Press.

Marx, G. W. (1881). The art of drawing and engraving on wood. [London], Houlston & Sons : Marx & Co.

Mayor, A. H. (1972). Prints and people, a social history of printed pictures. New York, The Metropolitan Museum of Art; New York Graphic Society.

McLean, R. (1972). Victorain book Design and Colour Printing. London, Faber.

McLean, R. (1988). Benjamin Fawcett : Engraver and Colour Printer : with a list of his books and plates. Aldershot, Scolar.

McLean, R. (1999). True to type : an autobiography of Ruari McLean. New Castle, Del., Oak Knoll Press.

Minott, C. I. (1971). "Albrecht Durer: The Early Graphic Works." Record of the Art Museum, Princeton University **30**(2): 7-27.

Morris, M. C. F. (1925). Benjamin Fawcett, colour printer and engraver. London; New York [etc., H. Milford, Oxford University Press.

Moxon, J. (1652). A Tutor to Astronomy and Geography; or An Easie and Speedy way to Understand the use of both the Gobes, Celestial and Terrestial. London, Joseph Moxon.

Moxon, J., H. J. Davis, et al. (1683, 1978). Mechanick exercises on the whole art of printing (1683-4). New York, Dover Publications.

Myers, M. L. (1966). "Rubens and the Woodcuts of Christoffel Jegher." The Metropolitan Museum of Art Bulletin **25**(1): 7-23.

Myers, M. L. (1991). French Architectural and Ornament Drawings of the Eighteenth Century

Metropolitan Museum of Art.

National Research Council . Committee on Next-Generation Currency, D. and G. T. Sincerbox (1993). Counterfeit deterrent features for the next-generation currency design. Washington, DC, National Academy Press.

Newton, I. (1717). Opticks: or, a Treatise of the reflexions, refractions, inflexions and colours of Light. Also two treatises of the species and magnitude of curvilinear figures [by Isaac Newton]. London, Smith and Walford.

Nicholson, W. (1898). An Alphabet. London, William Heinemann Ltd.

Nicholson, W. and L. Browse (1956). William Nicholson by Lillian Browse. London, Hart-Davis.

Nuttall, D. (1973). A brief history of platen presses. S.l., D. Nuttall].

O'Connell (1985). "Simon Gribelin 1661-1733 Printmaker and Metal Engraver." Print Quarterly **2**(1).

Papillon, J. B. M. (1766). Traité historique et pratique de la Gravure en Bois. (Supplément ... Tome troisième.). Paris.

Papillon, J. B. M. (1776). Supplèment du Traite Traite Historique et Pratique de la Gravure en Bois. Paris. **3:** P74

Papillon, J. B. M. (1822). Practical hints on decorative printing. London, William Savage**:** 91- 98.

Parshall, P. W., R. Schoch, et al. (2005). Origins of European printmaking : fifteenth-century woodcuts and their public. Washington, National Gallery of Art, in association with Yale University Press, New Haven.

Peterdi, G. (1971). Printmaking: methods old and new by Gabor Peterdi. New York London, Macmillan Collier-Macmillan.

Phillips, W. J. (1926). Technique of the Color Woodcut. New York, Brown-Robertson

Polo, M. and R. E. Latham (1968). The travels of Marco Polo. London, Folio Society.

Polo, M., H. Yule, et al. (1903). The book of Ser Marco Polo, the Venetian, concerning the kingdoms and marvels of the east. London, J. Murray.

Powell, J. (2003). Linoleum. Salt Lake City, Gibbs Smith, Publisher.

Puckle, J., E. Walmsley, et al. (1817). The club; in a dialogue between father and son. London, Imprinted by J. Johnson, St. James street, Clerkenwell].

Rearick, W. R. (1991). "Titian Drawings: A Progress Report." Artibus et Historiae **12**(23): 9-37.

Redgrave, G. R. (1894). Erhard Ratdolt and his work at Venice, a paper read before the Bibliographical society November 20, 1893. London, Printed for the Bibliographical society.

Reichel, A. (1939). The chiaroscurists of the XVI-XVII-XVIII centuries. Cambridge, Eng., W. Heffer & sons, limited.

Rembrandt Hamenzoon van Rijn, -. (1952). Rembrandt's Etchings: reproductions of the whole Original Etched Work. London, Phaidon Press.

Rembrandt Harmenszoon van Rijn, -. (1952). Rembrandt Harmenszoon van Rijn, 1606-1669. London, Paidon Press.

Reznicek, E. K. J. (1978). " Goltzius a counterproof in a review untitled." Simiolus: Netherlands Quarterly for the History of Art **10**(3/4): 200-206.

Ridler, V. (1948). "Artistic Printing: A Search for Principles." Alphabet and Image **6**: 4 -17.

Ritchie, W. (1987). Art deco : the books of Francois-Louis Schmied, artist/engraver/printer : with recollections and descriptive commentaries on the books. San Francisco, Book Club of California.

Rooke, N. (1926). Woodcuts and wood engravings : being a lecture delivered to the Print collectors' club on January 20th, 1925, on the origin and character of the present school of engraving and cutting by Noel Rooke. London, Print collectors' club.

Rosand, D. (1981). "Titian Drawings: A Crisis of Connoisseurship?" Master Drawings **19**(3): 300-308.

Rosand, D. (1985). "Exhibition Review: The Genius of Venice." Renaissance Quarterly **38**(2): 290-304.

Rosand, D., M. Muraro, et al. (1976). Titian and the Venetian woodcut a loan exhibition. Washington, The Foundation.

Rothenstein, J. (1952). Modern English painters by John Rothenstein. Vol.1 , Sickert to Smith. London, Eyre & Spottiswoode.

Royal Society of Arts (1819). Report of the committee of the Society of Arts, &c., together with the approved communications and evidence upon the same, relative to the mode of preventing the forgery of bank notes. London, Royal Society of Arts.

Rudolph, R. C. and C. Chien (1954). A Chinese printing manual. Los Angeles, Printed by The Ward Ritchie Press for members of the Zamorano Club.

Rue, D. L. (2007). "De La Rue timeline." from http://www.delarue.com/timeline/index.html.

Rummonds, R.-G. (1998). Printing on the iron handpress. New Castle, DE, Oak Knoll Press & The British Library.

Rummonds, R.-G. (2004). Nineteenth-century printing practices and the iron handpress. London, British Library.

Russell, C. E. (1926). English Mezzotint Portraits and their states from the invention of mezzotinting until the early part of the 19th century. London, Halton & T. Smith Ltd.

Sacro Bosco, J. d. and G. v. Puerbach (1485). Sphaera mundi. Venetiis.

Salter, R. (2001). Japanese woodblock printing. London, A. & C. Black.

Salter, R. (2006). Japanese popular prints : from votive slips to playing cards. London, A.&C. Black.

Savage, W. (18th March 1817). Letter to Mr C Nesbit, GW with Nesbits copy of *Practical Hints*: 2.

Savage, W. (1828). Miscellaneous Collections of Engravings in Relief, John Rylands University Library

Savage, W. (1822). Practical Hints on Decorative Printing. London.

Savage, W. (1832). On the Preparation of Printing Ink; Both black and Coloured. London, Printed by the author, and sold by Longman, Rees, Orme,Brown, Green, and Longman.

Savage, W. (1841). A dictionary of the art of printing. New York, B. Franklin.

Saward, B. C. (1883). Decorative painting : a practical handbook on painting and etching upon various objects and materials for the decoration of our homes. London, L. Upcott Gill.

Schaffer, S. (2004). "Illuminations." Prospect **105**: 34-39.

Schmidt, P. (2005). The Multiple Image: the beginnings of Printmaking, between old theories and New approaches. Origins of European printmaking : fifteenth-century woodcuts and their public. P. W. Parshall and R. Schoch. Washington, National Gallery of Art, in association with Yale University Press, New Haven:38-39

Seidlitz, W. v., A. H. Dyer, et al. (1910). A history of Japanese colour-prints. Philadelphia, J.B. Lippincott Co.

Seigner, M. C. (2004). "On Counterproofs." Print Quarterly **21**(2): 115-125.

Seller, J. (1682). Heraldry epitomized containing a short and easie way to attain that art, explained in divers examples : illustrated with variety of coats of arms, not only of the families of the nobility and gentry, but also of countreys, cities, corporations and fraternities. London, [s.n.].

Sexton, J. J. O. B. (1919). "Illustrated Books of Japan-IV. Utamaro's Book of Shells." The Burlington Magazine for Connoisseurs **34**(192): 92-100.

Sharp, G. (1874). The Gilbart prize essay on the adaptation of recent discoveries and inventions in science and art to the purposes of practical banking. London; Groombridge; Norwich, Fletcher and Alexander.

Silver, L., E. Wyckoff, et al. (2008). Grand scale : monumental prints in the age of Durer and Titian. Wellesley, Mass.; New Haven, Davis Museum and Cultural Center, Wellesley College ; in association with Yale University Press.

Simmons, R. (2002). Dictionary of printmaking terms Rosemary Simmons ; drawings by Jane Stobart. London, A. & C. Black.

Smith, C. M. (1967). The working man's way in the world. London, Printing Historical Society.

Smith, J. (1755). The printer's grammar: wherein are exhibited, examined, and explained, the superficies, gradation, and properties of...…the Theory and Practice of the Art of Printing. London, Printed for the editor.

Smith, R. H. (1884). Cutting tools worked by hand and machine : With 14 folding plates and 51 woodcuts. London ; New York etc., Cassell & Company Limited.

Southward, J. (1882). Practical printing. London, "Printers' Register" Office.

Southward, J. (1892). Artistic printing. London, "Printers' Register" Office.

Southward, J. (1897). Progress in printing and the graphic arts during the Victorian era. London, Simpkin, Marshall, Hamilton, Kent & co.

Southward, J. (1899). Modern Printing: a handbook of the principles and practice of typography and the auxiliary arts. London, 4 pt. Raithby, Lawrence & Co

Southward, J., A. Powell, et al. (1900). Practical printing : a handbook of the art of typography. London, Printers' Register Office.

Southward, J., A. Powell, et al. (1900). Practical printing a handbook of the art of typography. London, "Printers' Register" Office.

Statler, O. (1955). "Modern Japanese Creative Prints." Monumenta Nipponica **11**(2): 111-169.

Stijnman, A. (2000). "Oil-based Printing Ink on Paper " Papier Restaurierung **Vol 1** p61-67.

Tattersfield, N. and J. Bewick (2001). John Bewick : engraver on wood, 1760-1795 : an appreciation of his life together with an annotated catalogue of his illustrations and designs. London; New Castle, DE, British Library ; Oak Knoll Press.

Technicus (1924). Pigments; their properties and tests; a handbook for all engaged in the paint and colour trades. London, Scott, Greenwood & Son.

Temple, R. K. G. (2006). The genius of China. London, Andre Deutsch.

The Inner Mongolian Numismatic Research Institute. China Numismatics. Editorial, D. (1992). A compilation of pictures of Chinese ancient paper money. Beijing, The China Finance Publishing House.

Thompson, E. (1987). "Edward Gordon Craig: Letters Concerning *On the Art of the Theatre*." Matrix 7 **7**(Winter 1987): 57-68.

Thorpe, J. (1935). English Illustration: The Nineties. London, Faber and Faber.

Thurston, J. (1820). Illustrations to Puckle's club. Printed (for the proprietor) in colours, and limited to one hundred impressions. [London?

Timperley, C. H. (1838). The Printer's Manual; Containing Instructions to Learners, with Scales of Impositions ... together with Practical Directions for Conducting Every Department of a Printnig Office. London, H Johnson.

Tokuno, T. and Ksksks (1894). Japanese wood-cutting and wood-cut printing. Washington, Government Pr. Office.

Tsuen-Hsuin, T. and J. Needham (1983). Science and civilisation in China vol V:1, Cambridge University Press.

Twitchett, D. C. (1983). Printing and publishing in medieval China. London, Wynkyn de Worde, Society

Vedlich, J. and Z. Hu (1984). The prints of the Ten Bamboo Studio : followed by plates from the Kaempfer series and Perfect harmony. Ware, Hertfordshire, Omega Books.

Viesulas, R. (1979). "On Making and Displaying Inkless Embossed Prints on Dyed Paper." Leonardo **12**(2): 101-105.

Vinciolo, F. (1587, 1909, 1971). Renaissance patterns for lace and embroidery; an unabridged facsimile of the 'Singuliers et nouveaux pourtraicts' of 1587. New York, Dover Publications.

Wakeman, G. (1973). Victorian book illustration - the technical revolution Great Britain books illustrations Newton Abbot, David and Charles 182p

Wakeman, G. and G. D. R. Bridson (1975). A Guide to Nineteenth Century Colour Printers. Loughborough [Eng.], Plough Press.

Waterhouse, D. B. and A. British Museum. Dept. of Oriental (1964). Harunobu and his age; the development of colour printing in Japan. London, Trustees of the British Museum.

White, J. W. G. (1906). English illustration. 'The sixties': 1855-70. London, A. Constable.

Willam Savage 1822, J. J. (18th December 1828). Engravings on Wood, printed in colours at the type press by William Savage ...Miscellaneous Collections of Engravings in Relief London, John Rylands and Graham Williams in photocopy.

Williams, G. (1987). Naum Gabo monoprints : from engraved wood blocks and stencils. Ashford, Florin Press for Kettle's Yard, Cambridge & The Talbot Rice Gallery, Edinburgh.

Wisneski, K. (1995). Monotype/monoprint : history and techniques. Ithaca, NY, Bullbrier Press.

Woll, G. (2001). "Edvard Munch as a Graphic Artist." from http://www.munch.museum.no/grafikk/essay_en.htm.

Zilva, C. (1938). "The Landscape-Paintings of Rembrandt and Hercules Segers." The Burlington Magazine for Connoisseurs **73**(426): 132.

acetal resin Generic name for copypolymer and homopolymer. An industrial steel substitute for turning and machining Trade names, Delrin, Tecaform..
archival foam *see* Plasterzote
bed the table of a machine or press o which the forme lies. With the Albion platen press used in the project, it is the part of the relief press that is rolled under the platen.
blind emboss A block or plate printed without ink, to produces a bas- relief shape or pattern onto the substrate with no colour or tone other than light falling onto it.
block Used in the project to refer to type high relief printing surfaces 23.3mm
chase frame made of steel or cast iron to hold type and furniture for printing.
Delrin trade name for acetal resin manufactured by DuPont
die In this project, used to describe a carved or cut backing-block for the print or for the effect a heavily padded *make-ready* has on the print
dolly A tightly pointed bundle of fabric. Used in the intaglio technique of dabbing different colours onto an intaglio plate. Derived from the French word for a doll, still described in French as inking *à la poupée* which is also used in English. The relief equivalent used by Savage 1822 was small ink balls
douban Chinese system of registration: non-registered at outset, thus fitting a number of colour areas onto expensive wood. Each area registerd to a 'master overlay sheet'
dwell Describes a pause of the pulled handle of a platen press enabling a longer contact of the relief printing surface with the platen**em quad** Margin furniture acting as precise spacers that are locked between the block and the chase in the bed of the press.
forme A body of type, secured in a chase, for printing at one impression. ***forme***, type matter or type and blocks with its accompanying spacing material secured in the frame claled a chase. Glossary of printing terms 1962 p. 18
furniture material used in making margins, etc., for a printed sheet, also for filling up the space left in a chase after the type matter has been inserted.
ghost Used by printmakers, usually when intaglio monoprinting, to describe a *maculature Ghosting* also used by traditional printers to describe *setoff*
holding compound Replications of the glued parts of compound matrices in polypropylene sheet and magnetic matting, they act as receptors for components and for offset imagery, usually from *Linear Tone Blocks*. Detailed in Chapter 4 *Furniture*.
hollow tools wood cutting tools used with linoleum and vinyl with either a V or a curved profile.
ideograph A character or figure symbolizing the idea of a thing, without expressing the name of it, as the Chinese characters and most Egyptian hieroglyphics. *OED SEE FILE*
incuse a minting term used to describe a convex bas-relief in plaster that will produce a positive relief by casting, rather like the negative part of a die.
kiss used to describe the contact of the platen with the relief printing surface
kentō,kentōban Japanese registration system.
linocut *Linocut* is used in the thesis to describe the traditional way that lino is made into a graphic printing substrate by the use of woodcutting tools: usually V and round gouges and knives. A design cut in relief on a block of linoleum; a print obtained from this.' OED

makeready system of overlaid and underlaid paper that varies the pressure on printed matter.
maculature Inkless reprint generally used in printing for blotting or cleaning. Also called
mackle, mackled blurred, spotted, or spoiled.
movable type 'each letter, with some few exceptions, ... is cast upon a separate stalk, shank, or body.' Hansard 1825 first used the term.
offset an image that is transferred via a second substrate.
overlay packing over type or blocks that protects the work from the platen or forms part fo a mak ready.
plasterzote archival packing and padding material, used to pack press and to build up makeready to resemble a die
platen the part of a relief press that exerts pressure onto the print
quad, printers term for quadrat see below
quadrat spacing material within the line but wider than word spaces: em quad, 3-em quad. As a verb: use quads to quickly fill out blank portion of a line: eg quad the line
quoin Devices for locking up movable **relief press** Generic term for printing from an surface -inked printing block or plate surface, by downward pressure
shore hardness System of gauging firmness of flexible materials: ie soft foam 25, firm packing foam 90
stele An upright slab bearing sculptured designs or inscriptions. OED
sulcated grooved, fluted or channelled
suite (of blocks) A group of blocks used to print a single image, generally in colour.
sumi Japanese writing and drawing water-based ink made from soot, also used for printing
sumizuri Japanese 'printing with *sumi* ink on paper'
p.328 *The Dawn of the Floating World 1650-1765* Timothy Clark 2001
Tecaform trade name for acetal resin Tecaform AD is used in the project Tecaform AH has enhanced sliding properties. both used for turning as a metal subsitute.
template size used in thesis to describe the standard size into which all components of the system conform to: either by replication or addition. The final *Template Size* 228mm x 278mm accommodates the largest acetal resin block plus 12mm.
tympan frame on a handpress usually covered with parchment or linen canvas that folds over the printed matter. For printing engraving the tympan is packed with vinyl sheet.
tolerance the space need between two moving parts to enable movement; the space made by a piercing saw or laser beam between two cut-out parts: refers specifically to circular chase & laser cutting.
underlay layers of paper card etc placed under printing blocks. Often the preliminary to making ready, used to level up blocks before finer work. In the project underlays constantly change and are vinyl, steel and laminated mdf.