Chapter four: Isomorphism in typing and typography

4.0 – Introduction to chapter four

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Part two: 7yPo9R4Phy

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A typographic isomorph was always going to be time consuming

4.7 – Chunk
An alternative history of twentieth-century typography

4.0 – Introduction to chapter four

Until this point, isomorphism in communication design has been discussed in terms of imaging, format, materiality, and distribution. Chapter four takes up the discussion of typography from section 0.2 of my general introduction. The material covered here is approached from the perspectives of writing and designing text — termed “7yP1n9” and “7yPo9R4Phy” in what follows.[1]

In text, *content* is differently understood. For a typographer, the content of a sentence is the subject of its prose *and* its syntactical structure. In 1967, when Emil Ruder warned, “it is not the typographer’s business to interpret literature in his own way”, he apparently had not anticipated the coming of digital text, endlessly available for reformatting, not only according to the interpretations of designers, but by reading devices, software, and ultimately, the preferences of readers.[2] In 2021, no sentence can assume an immutably designed reciprocity with a definitive typographic form.

This chapter is organised into two parts. The first part, ‘7yP1n9’, in sections 4.1 to 4.4, covers *typing* as it presently exists, in the midst of the computational abstractions of digital inscription media.[3] The numerous convolutions that follow from the apparently simple action of typing letters at a keyboard reveal how *digital* text undermines a designer’s isomorphic intentions. In the second part of the chapter, ‘7yPo9R4Phy’, three longer discussions, in 4.5, 4.6, and 4.7, confront certain orthodoxies of *typography*, their historical origins, and the potential — in digital media — to reformat them in service of specific meanings.

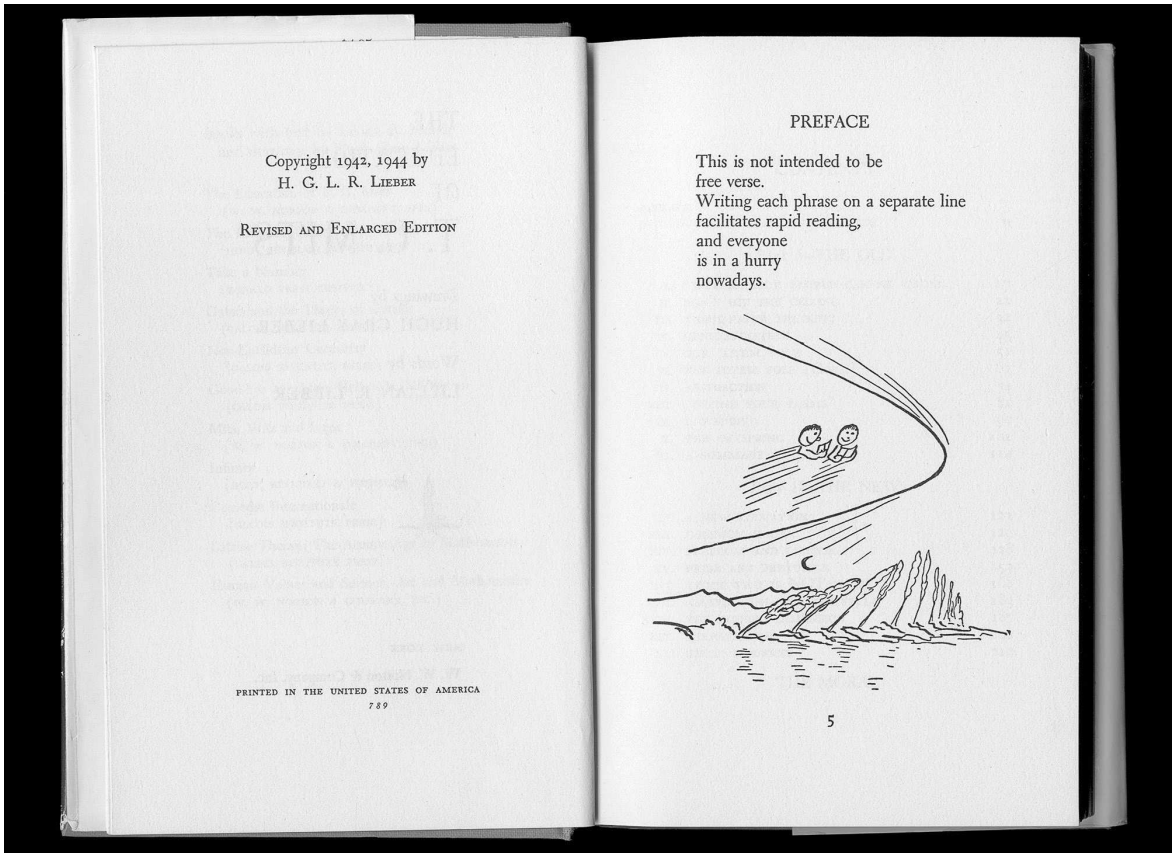
As hinted above, and in section 0.3 of the general introduction, the discussion in the second part of this chapter arrives at typographic forms that might only become possible when the roles of writing and designing are combined, or can operate in close collaboration. When writing and designing are combined, effects such as the dissection of sentences into their constituent phrases in mathematician Lillian R. Lieber’s 1942 *The Education of T. C. Mits* become possible (FIG. 4.0.1, 4.02). The work of information designer Edward Tufte is a case in point. Tufte is the author and designer of a series of substantial monographs on data visualisation. These books are evidently written *for* the

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1 These headings are written in L33T, which will be explained in 4.2.

2 Emil Ruder, *Typography: A Manual of Design* (Niggli, 1967).

3 Typing, at the keyboard of a typewriter, or a computer, as opposed to typesetting.



Copyright 1942, 1944 by
H. G. L. R. Lieber

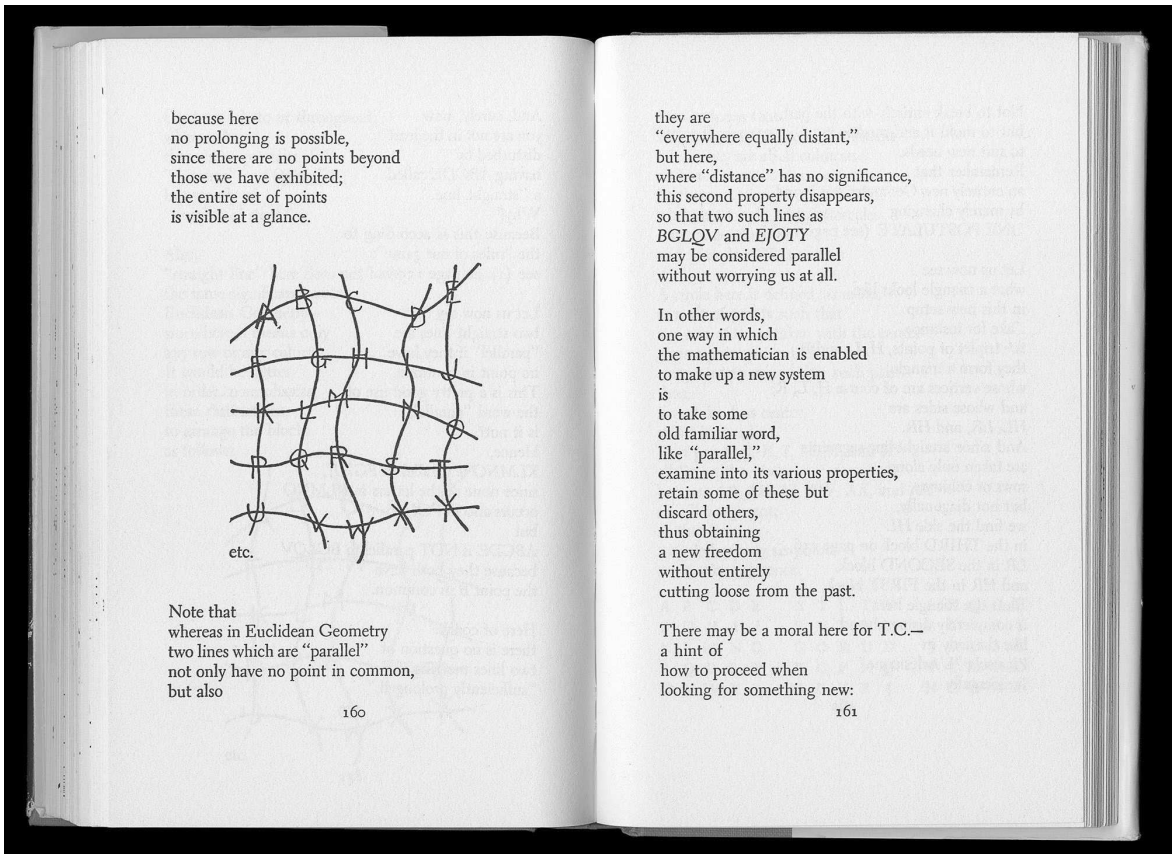
Revised and Enlarged Edition

PRINTED IN THE UNITED STATES OF AMERICA
7 8 9

PREFACE

This is not intended to be
free verse.
Writing each phrase on a separate line
facilitates rapid reading,
and everyone
is in a hurry
nowadays.

4.0.1. Lillian Lieber, *The Education of TC Mits*.



because here
no prolonging is possible,
since there are no points beyond
those we have exhibited;
the entire set of points
is visible at a glance.

etc.

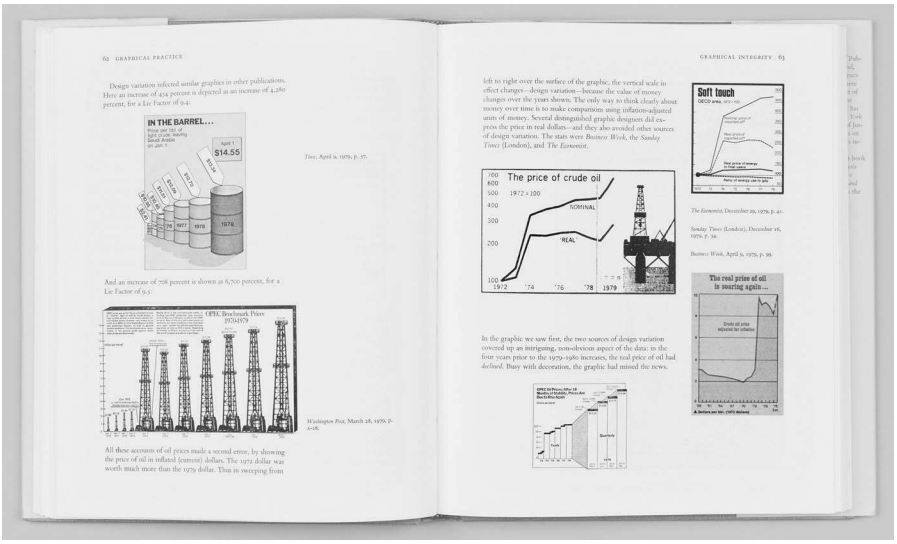
Note that
whereas in Euclidean Geometry
two lines which are "parallel"
not only have no point in common,
but also

they are
"everywhere equally distant,"
but here,
where "distance" has no significance,
this second property disappears,
so that two such lines as
BGLQV and *EJOTY*
may be considered parallel
without worrying us at all.

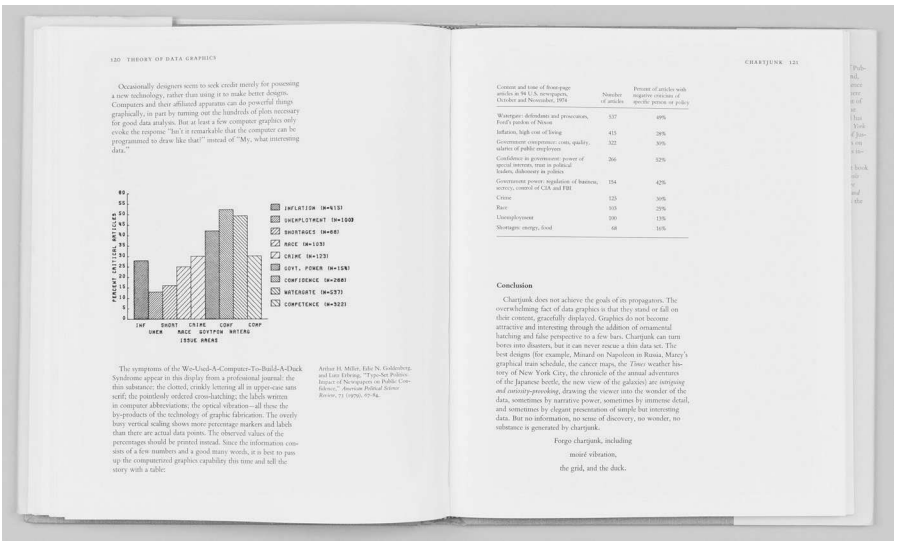
In other words,
one way in which
the mathematician is enabled
to make up a new system
is
to take some
old familiar word,
like "parallel,"
examine into its various properties,
retain some of these but
discard others,
thus obtaining
a new freedom
without entirely
cutting loose from the past.

There may be a moral here for T.C.—
a hint of
how to proceed when
looking for something new:

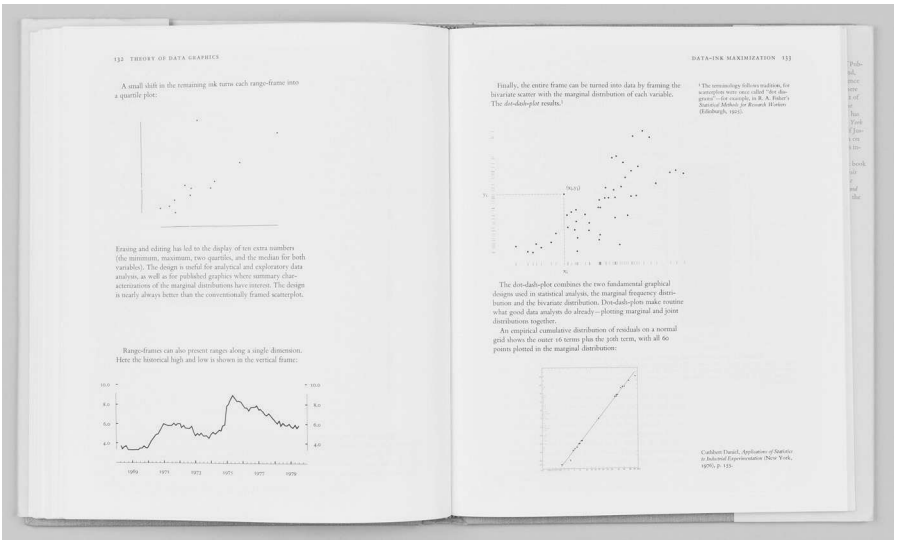
4.0.2. Lillian Lieber, *The Education of TC Mits*



4.0.3. Edward Tufte, *The Visual Display of Quantitative Information*.



4.0.4. Edward Tufte, *The Visual Display of Quantitative Information*.



4.0.5. Edward Tufte, *The Visual Display of Quantitative Information*.

page. Their arguments, and the presentation of their supporting visual examples, are organised according to the available space and consistent rhythm of the double-page opening (FIG. 4.0.3, 4.04, 4.05). Each opening is a self-contained unit of Tufte's argument.[4]

4.1 – E, R

Ford (2015) distances the contemporary gesture of typing at a computer from the consequent rendition of text:

> "Consider what happens when you strike a key on your keyboard. Say a lowercase 'a.' The keyboard is waiting for you to press a key, or release one; it's constantly scanning to see what keys are pressed down. Hitting the key sends a scancode. Just as the keyboard is waiting for a key to be pressed, the computer is waiting for a signal from the keyboard. When one comes down the pike, the computer interprets it and passes it farther into its own interior. 'Here's what the keyboard received — do with this what you will.'
>
> It's simple now, right? The computer just goes to some table, figures out that the signal corresponds to the letter 'a,' and puts it on screen. Of course not — too easy. Computers are machines. They don't know what a screen or an 'a' are. To put the 'a' on the screen, your computer has to pull the image of the 'a' out of its memory as part of a font, an 'a' made up of lines and circles. It has to take these lines and circles and render them in a little box of pixels in the part of its memory that manages the screen. So far we have at least three representations of one letter: the signal from the keyboard; the version in memory; and the lines-and-circles version sketched on the screen."[5]

In March 2015, Apple Inc. introduced a new model of its MacBook laptop computer, with a redesigned "butterfly" keyboard. The name butterfly refers to the two symmetrical flaps of the switch mechanism beneath each of its keys. At

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4 Scholar Johanna Drucker's "diagrammatic writing" is the most fully articulated example of this of which I am aware, but I do not discuss this further here.

5 Paul Ford, 'Code: An Essay', *Bloomberg Businessweek* (2015).

an announcement event for the computer, a presenter described the new keyboard design: “This butterfly mechanism is built of a single assembly and it’s supported by a stainless steel dome switch. That adds up to a key that is much more precise and accurate.”[6] Digital renderings of the mechanism were shown smoothly animated on the presentation screen, abstracted against a spotless black-grey gradient background.

In March 2019, *The Wall Street Journal* published a report titled ‘Appl Still Hasn’t Fixd Its MacBook Kyboad Problm’, cataloguing technical problems with Apple’s butterfly keyboard.[7] In the four years since its release, and despite iterations on its design, a significant number of consumers had apparently found the keyboards unreliable. Individual keys would become unresponsive, likely due — according to the *Journal* — to spots of dust that had gotten into their butterfly mechanism. When striking an unresponsive key, its expected tactile response would feel deadened, and no letter would be typed. In other cases, keys would register multiple unintended strikes, producing repeated letters in the typed text.

The presentation of the report on *The Wall Street Journal* website is novel. Five on-screen buttons allow the reader to toggle on or off reproductions of the typing inaccuracies exhibited by author Joanna Stern’s own MacBook Air computer. The entire text can be displayed with or without the letters E and R (unresponsive on Stern’s machine), and with or without double E and double T (producing unintended strikes for her). When the page is first loaded, the text appears by default without the letters E and R. A sentence from the first paragraph thus reads:

> “You s, to sha th pain of using an Appl laptop kyboad that’s faild aft fou months, I could only think of on ida: tak all th bokn ltts out of my column. Thn I alizd that would mak th whol thing unadabl.”[8]

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6 Video documentation of ‘Apple Special Event, March 2015’, Apple website. Via: podcasts.apple.com/us/podcast/applespecial-event-march-2015-1080p.

7 Joanna Stern, ‘Appl Still Hasn’t Fixd Its MacBook Kyboad Problm’, *The Wall Street Journal* online (2019). Via: www.wsj.com/graphics/apple-still-hasnt-fixed-its-macbook-keyboard-problem/. The title of the piece includes an ‘R’, presumably an exception made by an anxious editor.

8 Stern, ‘Appl Still Hasn’t Fixd Its MacBook Kyboad Problm’.

4.2 – EE

The second problem described by Stern, where what a typist perceives as a single strike of the E key produces multiple unintended instances of the letter in the typed text — EE — is not new, or particular to the butterfly keyboard design. In fact, it had confronted the designers of the earliest electrical keyboards. When a key is pressed, the electrical connection that it initiates might not be clean and distinct. Sometimes the key assembly will 'bounce', making multiple electrical contacts and causing the corresponding letter to be typed repeatedly. This problem is typically solved in software, with a function called 'debouncing', that discounts any key strikes which happen in the fractions of a second after the initial contact.

Debouncing is a relatively simple example of a growing number of material and algorithmic mediations that, in the context of computers and other digital devices, take place between a key strike (or tap) and a typed letter. Tenen (2018) argues that digital storage and distribution of text is so materially convoluted that any assumed correspondence between key strikes and text has been undermined:

> "We — readers, writers, interpreters — find ourselves today in an unprecedented, since the Middle Ages, position of selective asemiosis: the loss of signification. Many contemporary texts, such as the poems inscribed into bacteria and encrypted software, exist simply beyond the reach of human senses. Other forms of writing are illegible by design, in ways that prevent access or comprehension. Increasingly, we write not in the sense of making marks on paper but in simulation. Key presses leave lasting traces in computer memory, which then appear on-screen redoubled and ephemeral. On disk, marks endure in a form legible only to those who possess the specialised tools and training necessary to decipher them."[9]

Tenen, an associate professor in the Department of English and Comparative Literature at Columbia University, and formerly a software engineer at Microsoft, locates the contemporary material inscription of typed text neither on the screen nor the page:

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[9] Dennis Tenen, *Plain Text: The Poetics of Computation* (Stanford University Press, 2017).

> "Were I to interrupt a digital typist to ask, 'Where do these words reside?' I would likely receive several conflicting answers in response. In some sense, the words are on-screen, where they can be viewed. In another sense, they are somewhere within the machine, on remote and hermeneutically sealed surfaces: silicon chips, hard drives, flash memory cards. In yet another sense, visible signs are still further removed from the contexts of their production. The word is in the wires. It spreads across servers, routers, and data centers. What was once apparent takes on a more complex structure, stretched across planes and temporalities. ... Digital texts form a live lattice, a multi-dimensional grid, that connects a letter's tactile response at one's fingertips to its optic and electromagnetic traces."[10]

This metaphorical lattice would seem to subvert any understanding of the key strike — on a keyboard, or a screen — and the letter — on a screen, or a printed page — as isomorphic. Digital text is remote, always potentially reconfigurable according to the preferences of a *user*, and therefore indeterminate. Yet, in another sense, digital text is *overdetermined*. It is searchable, made available to keylogging algorithms that parse it in pursuit of what it reveals about us. Online communication cultures have evolved to resist the involuntary processing of text. Computer users — the paranoid and the inventive — have become amateur cryptographers and bricoleurs of the digital glyph, devising practices such as 1337 $p34k, or "leetspeak", in which glyphs are substituted with visually similar alternatives — be they numbers, punctuation, or symbols — in order to make the resulting text *invisible*, except to those in the know. 70 r3CL41m 73X7 fR0M 172 M374d474.[11]

4.3 – U/u

Before the advent of the electrical keyboard connected to a digital computer, even the mechanical typewriter's apparently direct correspondence of key strike and letter created subtle semiotic disparities. In November 2017, while lecturing at the Hochschule für Gestaltung Karlsruhe, on the subject of isomorphic graphic design, I presented an image of the stage for Norman Potter's play *In:Quest of Icarus*, designed with a typewriter, and formally resembling the

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10 Tenen, *Plain Text*.

11 Generated using the Leet generator website https://1337.me .

typewriter, as discussed in section 0.1, above. Alongside it, I showed a close-up photograph of the U key of Potter's own Olivetti Lexikon typewriter (FIG. 4.3.1, 4.3.2).[12] I described Potter's practice of experimenting with the typewriter to develop a kind of typographic drawing — a practice that exploited the constraint of the machine's monospaced grid to arrange letters and punctuation in pictorial formations.

Following the lecture, Professor Matthias Bruhn, an art historian, pointed out a discrepancy between the form of the letter U, as it appears on the key in my photograph, and on the page in the typed stage design. He observed that the Lexikon's key displays a monolinear, uppercase sans serif letterform, with rounding at the terminals. The key itself is circular and black, with what would originally have been a white glyph, now dirty and discoloured. Potter's typographic drawings, Bruhn noted, exhibit neither these exact forms nor colours. Potter's Lexikon was evidently fitted with a typeface that had contrast in its letterforms, thick serifs, and had been used to type in black ink on warm white paper. A rather pedantic remark, I thought at the time, but, on reflection, an important one.

Disparities between how a key appears, as itself an object of display, and the letter it causes to be typed, are exacerbated by the software keyboards of smart phones, tablets, and other touch-screen devices where the key and the typed letter are represented simultaneously on the same display. The first iPhone, introduced by Apple Inc. in 2007, had an on-screen keyboard operated by tapping — with fingertips — representations of letters, framed by graphical 'keys' on the screen.[13]

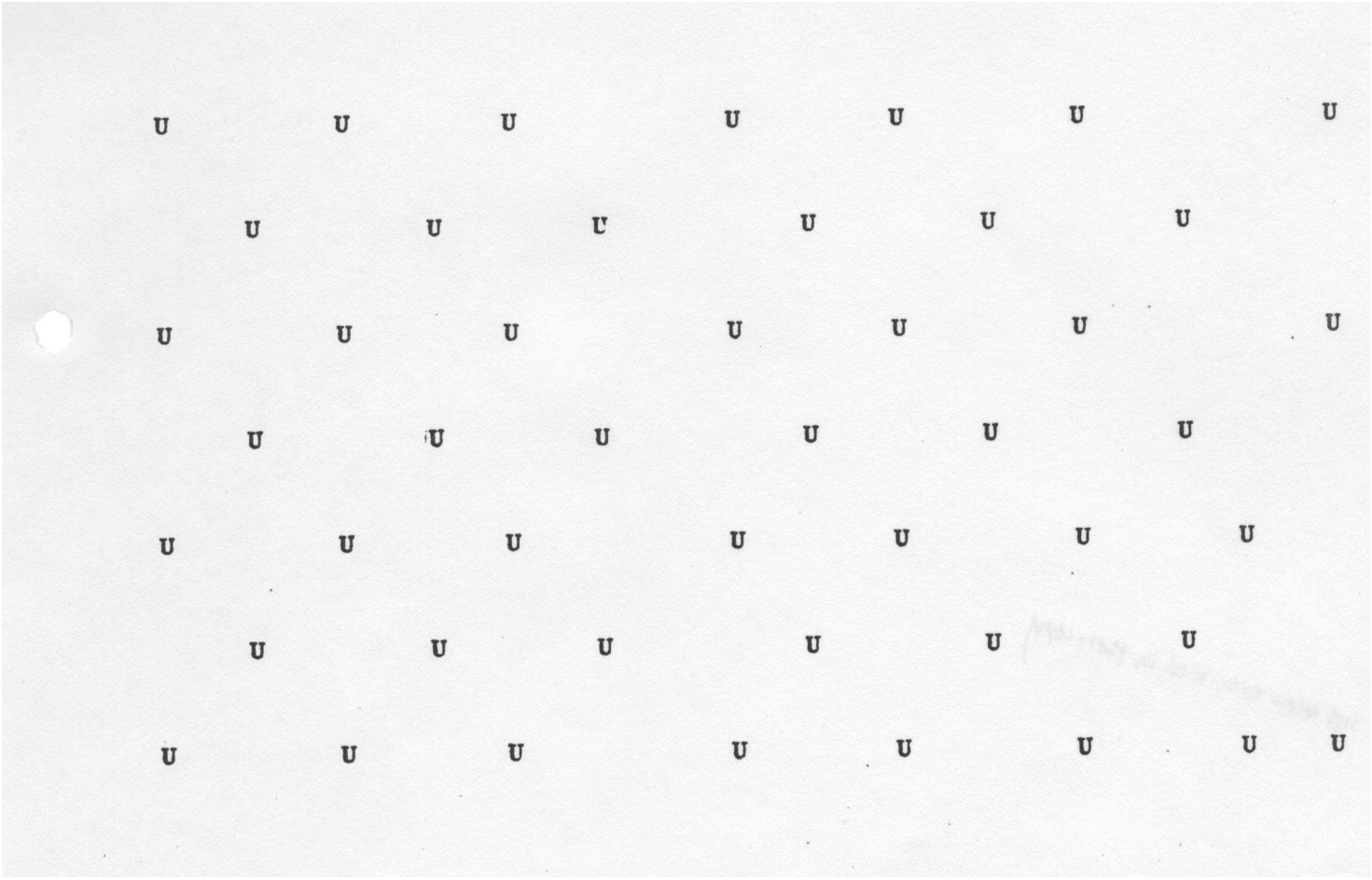
Between 2007 and 2015, when the iPhone's iOS operating system reached its ninth version, its on-screen keyboard, like the majority of mechanical keyboards, displayed only uppercase letters on its keys.[14] The typist could tap a shift key to manually toggle between typing uppercase and lowercase letters. In

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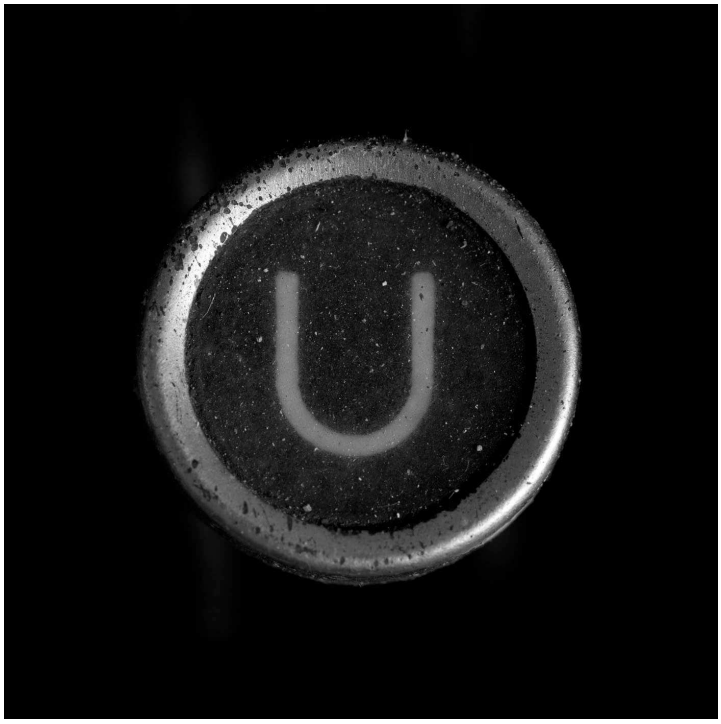
12 Norman Potter Archive.

13 Not the first example of a software keyboard, but the first to become a mainstream commercial success, and therefore to be exposed to the level of scrutiny that befalls a popular consumer appliance. The software keyboard in the Google Android mobile operating system adopted graphical representations of uppercase and lowercase keys earlier than iOS, but for the purposes of this argument, the iterative narrative of Apple's adoption of this approach is more revealing because it demonstrates conflict between a formally reductive, iconic, design approach and a conceptually reductive isomorphic approach.

14 The first versions of the operating system were called 'iPhone OS', the name iOS applies since version four in 2010.



4.3.1. Norman Potter, *In:Quest of Icarus,* typed representation of stage, detail.
Norman Potter Archive.



4.3.2. Key from Potter's Olivetti Lexikon typewriter.
Photograph by Stuart Whipps.

normal typing, this transition was partially automated in software: after the full stop and space key were typed in succession, the typed text would change to uppercase for one letter — assumed by the system to be the capital at the start of a new sentence — thereafter reverting to lowercase. The current state of capitalisation was signalled to the typist by graphical changes in the appearance of the shift key. This key's default appearance in iOS is an arrow pointing up — the "up" of uppercase — consistent with the conventions of mechanical keyboards, and dating back to the organisation of the sixteenth-century compositor's workspace. In iOS 6's lowercase state, for example, this arrow was rendered in white outline on a dark grey key. In its uppercase state, the arrow was shown in solid white with a diffuse white glow lightening the grey of the key around the arrow. Throughout the version history of iOS, the uppercase state has generally been represented by graphically filling in the arrow.

Among online commentators, criticism of these design decisions was common. The overall aesthetic of iOS 6 was heavily criticised, labelled "skeuomorphic" for its exaggerated use of drop-shadow and other lighting effects to simulate three dimensionality in its interface.[15] Numerous critics published commentaries illustrated with comparative images showing the appearance of the graphical shift key in its active and inactive states across versions of iOS.[16] The uppercase/lowercase criticism became more pointed in 2013, with the introduction of iOS 7. In this version, the overall design language of the system was radically simplified, with less use of colour as a labelling device, less skeuomorphic graphic effects, and the reliance on very light fonts of the Helvetica Neue typeface, even for text in small sizes. The graphical distinction between capitalisation states in iOS 7 was minimal. In lowercase, the arrow on the shift key appears in thin black outline on a mid-grey key. In uppercase, the key becomes a darker grey, the arrow changes to white, but remains in outline. Some perceptual threshold had apparently been crossed, whereby at a glance many users could not determine the current capitalisation state by looking at the

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15 Skeumorphism meaning, in this context, the visual reproduction of affordances of previous typing technologies that were products of inherent constraints of those technologies and that are graphically simulated only to appeal to notions of continuity in interface design.

16 For example: Jason D. O'Grady, 'Why does Apple suck at keyboards?', ZDNet (2014). Via: https://www.zdnet.com/article/why-does-apple-suck-at-keyboards/. Eli Schiff, 'The Mental Model' and 'Keyboard Smörgåsbord', personal website (2015). Via: http://www.elischiff.com/blog/2015/2/25/the-mental-model and http://www.elischiff.com/blog/2015/9/29/keyboards-smorgasbord. Alborz Heydaryan, 'How Can Apple Fix Its Shift Key Problem Once and for All', Medium (2016). Via: https://medium.com/@AlborzDesign/how-hard-is-it-to-get-the-shift-key-right-a5525cd90968. At least one website existed solely to parody the confusion: ismyshiftkeyonornot.com/.

keyboard. A persistent cognitive burden was being exerted on these users, unable to anticipate exactly which letter would be produced by their next tap.

Criticism of the illegibility of the capitalisation state in the iOS shift key was diverted in 2015 with the introduction of iOS 9 and its radical graphical expression of the capitalisation state. In this version, the letter represented on every key on the keyboard transitions dynamically between displaying uppercase and lowercase letters consistent with the current capitalisation state. iOS 9 also introduced a new proprietary system typeface for Apple devices, named 'San Francisco'. Typing in iOS in 2021 — now in version fourteen — is perhaps the most isomorphic experience possible in the "multi dimensional grid" of digital text that Dennis Tenen describes. Typing on the default system keyboard in an application that respects the default system font can produce an absolute graphical correspondence of pixel-level fidelity between the appearance of the key and the typed letter.

4.4 – *Woof*

In a 2007 documentary about, and named after, the ubiquitous typeface *Helvetica*, filmmaker Gary Hustwit visits graphic designer Massimo Vignelli in his New York studio. Vignelli speaks to camera about his long term philosophical preference for using only very few typefaces in his work. He says, with a wry expression that softens the statement: "I don't think that type should be expressive at all. I can write the word 'dog' with any typeface and it doesn't have to look like a dog. But there are people that when they write 'dog' it should bark."[17]

Later in the film, in Amsterdam, Hustwit hears Dutch graphic designer Wim Crouwel make a similar point with an example of his own work:

> "If I see today, designers they use all typefaces … one day one typeface, the other day the other typeface. All in favour of a certain atmosphere. I don't like that. … I made these post stamps on De Stijl movement. In the beginning, if you see the sketches, I tried to use typefaces from Van Doesburg, one of the artists of De Stijl movement. Then, I decided for the final designs not to use

[17] Transcript of Vignelli in *Helvetica*, directed by Gary Hustwit (2007).

> these typefaces, because the illustration is already from the period … I used the most neutral typeface, Helvetica. … The meaning is in the content of the text, and not in the typeface."[18]

The terms "expressive" and "atmosphere" are used here to politely sneer at a loosely-defined vernacular typography, the lowest common denominator of unsophisticated visual communication, perhaps now itself evocative of a fondly remembered, pre-globalisation urban landscape. Unfortunately for Vignelli and Crouwel's generation, desktop publishing and the internet unleashed their worst fears about visual literacy.[19] The pretence of typography's rational authority can hardly be maintained in an era of Ltypi, online meme-generators, and wildly popular social media polls that ask earnestly if the word water "sounds different in your head" when it appears with a stock photograph of rippling water as a background.[20]

This is not strictly an amateur/professional distinction. Consider a label listing ingredients on a piece of food packaging that follows one of the many national guidelines for identifying allergens. A ubiquitous typographic device distinguishes allergens by presenting them in bold type. Slight variations on the phrase "for allergens, see ingredients in bold" appear on countless packaging designs. Anecdotal research suggests that most of these designs present the words "in bold" *in bold*. This has the undeniably useful function, for the eye that quickly scans the label, of immediately relating whichever ingredients are emboldened to the explanation of why, normally placed somewhere else on the label. Presumably, Vignelli and Crouwel would argue that this is redundant, and that the phrase "for allergens, see ingredients in bold" has an identical meaning whether it is in bold or not.

But perhaps what offends the Vignelli-Crouwel sensibility most profoundly is a more mischievous kind of punning. The "mindsmile" is a term apparently introduced by Beryl McAlhone's 1996 book *A Smile in the Mind: Witty Thinking in Graphic Design*. A single graphic object dominates mindsmile mind-share: the logo for international courier FedEx, designed by Landor Associates in

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18 Vignelli in Hustwit, *Helvetica*.

19 Sadly, Crouwel and Vignelli both died in the past decade.

20 Ltypi, or 'Lack of typographic imagination' is a long-running discussion group on the image sharing website Flickr. The term refers to instances where the *name* of a typeface — rather than any technical or aesthetic suitability — seems to have suggested a typeface be chosen for a particular work of communication design. The group had been dormant for some time, until recently revived, on Twitter, following the launch of a newly designed website for the US Central Intelligence Agency set in the typeface America, designed by the Swiss foundry GrilliType.

1994, in which an arrow — practically the universal symbol in courier branding — is created in the negative space between the capital E and lowercase x of the company's name, as it is set in the typeface Futura Bold. It is at once devilishly clever and apparently effortless. Stephen Kelleher Studio's 2021 monogram for fast food franchise Burger King has recently revived the genre. If the mindsmile is all about a radical economy of text-image coincidence, then this monogram appeals with its simultaneous exploitation of both the structural relation between the capital B and K, *and* their conjoined form being a functional icon of two pieces of bread and a meat patty.

That any of this can be parsed as an intellectualised distinction — the subject of graphic snobbishness — is made complex by such typographic puns seeming to have much in common with the altogether more cultured genre of concrete poetry. Ian Hamilton Finlay's *The blue and the brown poems*, for example, operate by having words *perform* themselves and their semantic relations through spatial formation, colour printing, and overprinting effects.

In this discussion, the keyboard itself deserves another glance. Its limitations and affordances subtly condition what can be typed. NOTICE, FOR EXAMPLE, THAT WE HAVE A HARDWARE CAPS LOCK, and those who use it in extended prose are considered obnoxious. And yet we make no affordance for italics on the keyboard. The handling of italics in computer software marks a boundary between the amateur and professional production of documents. In the history of word processing software, an italic effect has typically been achieved by clicking an interface button that triggers a simple algorithmic operation to remap the coordinates of the letterforms into a slanted formation. In page layout software, the italic — at least in best practice — is an entirely distinct font file, whose letterforms are separately drawn to their Roman counterparts, observing a distinct historical tradition.

Editorial customs associated with typographic styling can also be contentious. Barokka (2020), finds colonial undertones in the use of italics for words outside the primary language of the text (typically English):

> "I've come to understand the practice of italicizing such words as a form of linguistic gatekeeping; a demarcation between which words are 'exotic' or 'not found in the English language,' and those that have a rightful place in the text: the non-italicized."[21]

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21 Khairani Barokka, 'The Case Against Italicizing "Foreign" Words', *Catapult Magazine* (2020).

4.5 – Line

Why do we read text in long, thin lines of type? Why do those lines end arbitrarily, when no more words fit in the given space, and not deliberately, in service of the rhythm and meaning of the text? Such questions might appear disingenuous. How else to read these words than by lining them up and, well, *reading* them? What is reading even, if not the action of moving one's attention along a line of words in order to comprehend their meaning?[22] The answers to these questions are not as self-evident as they seem. They are entangled in millennia of writing and reading *practices*. Practices of organising language on a page that became *conventions*, habitually understood and expected by readers. Conventions that later informed the *technics* of a paradigm shift from writing to typography. Technics whose incredible industrial proliferation continues to define the presentation of language in contemporary digital contexts, where the material constraints of the printed page *should* be irrelevant.

In a vitrine in the high security 'strong room' at the Gutenberg Museum in Mainz, Germany, an original forty-two-line printed bible is shown open, next to a contemporaneous missale, whose gothic textura script is hand-lettered.[23] Emphasising their close graphic resemblance is the point of the display. When Johannes Gutenberg invented printing with movable type in Europe in the 1450s, he was careful to respect conventions for presenting words on a page. Gutenberg was neither a scribe nor an artist. Scholar Frédéric Barbier admits that, "Gutenberg and the first printers offered their readers a product as close as possible to the manuscript."[24] The first printed bible faithfully recreated the

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Via: https://catapult.co/stories/column-the-case-against-italicizing-foreign-words-khairani-barokka.

22 While "knowing the linear order of creation of a line of Western language is the necessary first step toward understanding the message", non-Western forms, such as the networks of knotted strings that comprise Incan khipu do not necessarily share the same one dimensional character. "Attempts at reading khipu to date have begun with reading the knots, but the knots were the last, not the first, chronological element in the khipu information string." William Conklin, 'A Khipu Information String Theory', J. Quilter and G. Urton (eds.) *Narrative Threads: Accounting and Recounting in Andean Khipu* (University of Texas Press, 2002), 54.

23 The Gutenberg Museum holds two of the extant copies of Gutenberg's forty-two-line bible. Alongside it is the *Missale Moguntinum*, handwritten on parchment, Mainz, 1444.

24 Frédéric Barbier, *Gutenberg's Europe, The Book and the Invention of Western Modernity* (Polity Press, 2017), 204. Barbier describes the compositors workspace organised around the interface of the manuscript and the cases of type: "The manuscript, or copy of an earlier edition, was removed from its binding and its leaves placed in order on a support, the visorium, above the case — a flat, open box, sloping slightly forwards and divided into compartments in which the fonts were placed.

layouts of the manuscripts of its time, which, following centuries of scriptorium practices, had been made by the laborious copying of lines of text by hand.

Such graphic caution had prevailed a millennium earlier, too, when the codex book itself was replacing the scroll as the predominant format for distributing text:

> "Even though Christian scribes did not consider the roll a proper form of book, they still clung to earlier traditions of layout. Although some of the first books display one column per page, the finest early and nearly complete Bible codices extant today (from the fourth and fifth centuries) were planned with three or four columns per page ... When one opens an early Christian or Byzantine luxury manuscript, such as the Codex Sinaiticus, one sees eight columns across two pages, which gives the impression of an open scroll."[25]

Gutenberg's effort to establish graphic continuity with the scribes should not be mistaken for conservatism. The printed bible in that vitrine in the Gutenberg Museum was never an innocent homage to an artisanal tradition. It was a calculated, *skeuomorphic* object. An infiltrator in familiar disguise. And Gutenberg's 'print house' on nearby Am Brand in Mainz had little in common with the sacred, concentrated atmosphere of the scriptorium. Gutenberg's invention was a monstrous assemblage of technologies in paper-making, ink chemistry, punch-cutting, xylography, and pressing mechanisms. In that workshop, the skilled, concentrated performance of hand-lettering texts was being radically transformed into a concatenation of wood and metal *hardware*.

There were slight, but telling, graphic innovations on Gutenberg's pages. Western typography was born 'justified'. Every line of text extended to the full width of the column, and hyphens were used to assist the reader in identifying words that had to be split and carried onto the next line to achieve an exact fit. This was indeed a new way of constructing the page, with modular, *movable*, elements whose optimal position could be determined by making micro-adjustments in spacing *before* a mark was made on the paper. Text could now

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The compositor stood to 'lift' the characters letter by letter with tweezers and arrange them, line by line, in a composing stick, with a strip which had previously been justified, that is, set to a length so that the successive lines would form a homogenous block." Barbier, 133.

25 Leila Avrin, *Scribes, Scripts, and Books — The Book Arts from Antiquity to the Renaissance* (University of Michigan, 1991), 174.

be planned — *designed* — with an anticipatory overview of the space available for it.

While the scribes working prior to Gutenberg's invention were accomplished craftspeople, the dense, straight lines of writing in their manuscripts had, in fact, already been rationalised by an encounter with *another* machine. It was the weaving loom that had provided the linear template guiding the scribe's hand:

> "The idea of the text as a woven tapestry may seem strange to modern readers accustomed to seeing letters and words in print ... the prototype for the straight, ruled lines of the manuscript, between which the letters were arrayed, lay in the warp strings stretched taut on the loom. Originally these ruled lines were scored, and — as with warp-lines — were faint or invisible. When Gutenberg adopted textura for his first printed type, the lines disappeared altogether."[26]

As he had with the justification of text, Gutenberg was confident in subtly departing from manuscript tradition if he could improve on it without controversy. *Look, no guides!*

But in fact, the linear presentation of writing — Gutenberg's historical inheritance — is considerably more storied. Drucker (1995) takes the narrative back farther, into the preceding millennium:

> "Changes occurred in the function and place of writing within the social order in the centuries following the decline of the Roman Empire. The activity of writing shifted emphasis — from the carving of monumental inscriptions, writing of classical poetry, and recording of legal and historical texts — to the copying of religious and classical texts within the province of religious communities. These transformations had been preceded by

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[26] Tim Ingold, *Lines* (Routledge, 2007). Ingold identifies the word text as a metaphor derived from weaving. Mary Carruthers, in *The Craft of Thought*, describes the physicality of the labour involved in preparing and working the surface of a manuscript, before the adoption of paper as the preferred substrate for codices: "We should keep in mind the vigorous, if not violent, activity involved in making a mark upon such a physical surface as an animal's skin. One must break it, rough it up, 'wound' it in some way with a sharply pointed instrument. Erasure involved roughing up the physical surface even more: medieval scribes, trying to erase parchment, had to use pumice stone and other scrapers. In other words, writing was always hard physical labour, very hard as well on the surface on which it was being done ..." Mary Carruthers, *The Craft of Thought: Meditation, Rhetoric, and the Making of Images, 400–1200* (Cambridge University Press, 1998).

> certain technical changes: vellum replaced papyrus as a material support for writing and the codex (sheets bound into books) replaced the scroll. The monumental capitals which had been produced for and in stone inscriptions were replaced by graphic forms originating from the use of the pen, rather than the chisel, stylus or brush. Finally, the division of elements within the text came to be visually marked so that titles, beginnings, endings, and commentaries came to be organised spatially and indicated by distinctions of size and design to a far more complex and nuanced degree than was practical within monumental inscriptions."[27]

These "visual markings" are the foundations of typography as we now understand it. As the scribe's practices and materials were being consolidated and optimised, so the European population was becoming more literate. A social notion of the *page* as the site of a reciprocal exchange between the text and the reader — taken unquestioningly for granted by contemporary readers — was then only emerging:

> "In Carolingian manuscripts, the words had usually not been separated, which made an oralized reading necessary. Gradually, an increasing autonomy of the text developed together with the growth of silent reading, especially among scholars. This required a careful management of the written text so that it contained within itself the indicators that would make a productive reading possible. This led, especially, from the eleventh century, to major changes in the *mise en livre*, with the separation of words, the division of the text into autonomous sections and subsections, the growth of indexes, etc. Similarly, a standardised system of punctuation spread, especially in the twelfth century, with the period or full point (marking the principal scansion), the semicolon, the period or full point with a circumflex over (for secondary scansions) and the hyphen (for words split at the end of the line)."[28]

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27 Johanna Drucker, *The Alphabetic Labyrinth: The Letters in History and Imagination* (Thames & Hudson, 1995).

28 Barbier, *Gutenberg's Europe*, 48.

Following the invention of printing with movable type, this expanding, social conception of mise en livre, combined with the mechanisation of printing, actually compounded and accelerated innovation:

> "The standardised presentation of the book in quires related to the linear, analytical and hierarchized structure of thought: linear, because the reader necessarily followed the development, itself linear, of the discourse; analytical because the analysis of the alphabetical system was continued in that of the discourse in sentences, paragraphs, chapters, parts, etc., made visible by the typographical arrangement and organised with the material structure of the volume in leaves and pages; hierarchised, because this analysis in smaller and smaller units substituted for mnemotechnical reference a detailed and abstract scale of the components of the discourse. It was inevitable that this standardisation would eventually lead to a standardisation of grammar, orthography and the usages of the 'classical' language."[29]

As well as stimulating the evolution of the autonomous, legible page, the introduction of printing also brought new economic imperatives. Despite the incredible magnitude of Gutenberg's invention, paper, metal, ink, and labour remained expensive, and the early commercial practice of printing was a precarious trade. For print to establish itself, there was an urgent need for rationalisation, reduction, and standardisation of text. In this context it is easy to understand why it likely never occurred to Gutenberg and his contemporaries to question the proposition that text is linear.

To locate the conceptual marriage of writing and the linear, we must go back farther still.

> "Of course, narrative has to do with the temporal sequence of events, and thus in all narrative there is some kind of story line. As the result of a sequence of events, the situation at the end is subsequent to what it was at the beginning. Nevertheless, memory, as it guides the oral poet, often has little to do with strict linear presentation of events in temporal sequence. The poet will get caught up with the description of the hero's shield and

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[29] Barbier, *Gutenberg's Europe*, 258.

> completely lose the narrative track. In our typographic and electronic culture, we find ourselves today delighted by exact correspondence between the linear order of elements in discourse and the referential, the chronological in the world to which the discourse refers. We like sequence in verbal reports to parallel exactly what we can experience or can arrange to experience."[30]

Linear presentation of text has produced a particular kind of sequential writing and thinking. Other, non-linear, ways of thinking have been obscured:

> "Writing thus tends towards the construction of images, toward a strict linearisation of symbols. For classical as well as modern thinking, the alphabet is more than just a means of committing to memory the progressive acquisitions of the human mind; it is a tool whereby a mental symbol can be noted in both word and gesture by a single process. Such unification of the process of expression entails the subordination of graphism to spoken language. ... However, it also entails an impoverishment of the means of nonrational expression. ... if we tend to believe that human potentiality would be more fully realised if we achieved a balanced contact with the whole of reality, then we may ask ourselves whether the adoption of a regimented form of writing that opened the way to the unrestrained development of technical utilitarianism was not a step well short of the optimum."[31]

There are two historical forces at play here. That the invention of printing stimulated growth in literacy, which in turn stimulated innovations in the graphic practices of making text legible, is of course a historical narrative beyond reproach. It inspired a dizzying explosion of typography and set in motion the series of events that would eventually bring graphic design into existence as a profession. But the material history of printing has had other, more repressive influence on typography. Kinross (1992) argues that typography

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30 Walter J. Ong, *Orality and Literacy, The Technologising of the Word* (Routledge, 1982), 144.

31 André Leroi-Gourhan, *Gesture and Speech* (MIT Press, 1964). Wood (2008) tells a history of Leonhard Wagner, an early-sixteenth-century scribe who "rebelled against the press", and its imposing limits "to what a culture can say with its scripts": "Wagner's hypertrophy of alphabetic choice was a handcrafted, cloistered protest against the strict binarism of mechanical typography, imposed by the logics of machines and business." Christopher Wood, *Forgery, Replica, Fiction* (University of Chicago Press, 2008), 275–277.

became *modern* when it grew out of Gutenberg's skeuomorphic guise, and became able to demonstrate its own inherent qualities:

> "The essential modularity of printing could not be fully realised, and capitalised on, until common standards of description and manufacture had been worked out and adopted. Progress towards this state depended on published information and discussion. This brings us near to an essential constituent of the sense of 'modern' as it is here being used. Modern typography exhibits a rational impulse, both internally in ordering its own workings, and externally in the face it presents to the world."[32]

These rational forces of consolidation — vital, as they were to the development of print culture, as we know it — also established a far more inert force of conservatism, fixing certain assumptions about the page in *hardware*. The innovations of twentieth-century typography took place on the margins of industrial print production, and required extraordinary artistic and technical labour to realise. Not even the now-canonical, then-radical, European commentaries on the page, by Tschichold, Lissitzky, and others, thought to question the line. They criticised historical letterforms, historical page layouts, but never the essential logic of the line. So absorbed into conscious reality was the line, that when, in the early 1970s, a research group at Stafford College of Art and Design in the English Midlands, produced a series of publications comparing different text typographies, in the context of an emerging international interest in the computerisation of typesetting, they too never thought to question the line:

> "Those typographers who have formed the mainstream of functional and humanist thought in European typography during the last quarter of a century take the view that unjustified setting is desirable because it enables many practices such as uneven word spacing, word breaks, and widows (one-word lines at the ends of paragraphs) to be eliminated. ... A problem for unjustified setting only is that, instead of having to hyphenate individual words, attention needs to be paid to word-group breaks which must be related to the structure of the sentence rather than

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[32] Robin Kinross, *Modern Typography: an essay in critical history* (Hyphen Press, 2004), 23.

allowed to occur by chance."[33]

Here, at the very advent of computerised typography, there is no reevaluation, no questioning of the superstructure. The discussion concerns finessing the details of typesetting and their rationalisation and encoding in digital software. The question of the relative merits of justified and unjustified settings appears hardly to have developed since Gutenberg. Ultimately, the introduction of digital typography to mainstream publishing was, exactly as Gutenberg's invention centuries before had been, just a *remediation*.

4.6 – Scribble

In 1934, Marcel Duchamp's the *Green Box* was published in Paris, in an edition of 300. The format was a set of ninety-three variously-sized papers, bearing collotype reproductions of Duchamp's notes, loosely gathered in a card box. The complex network of original manuscripts from which these notes derived, many of them handwritten on disparate fragments of paper, had been made by Duchamp in the preparation of his "definitively unfinished" artwork *The Bride Stripped Bare by Her Bachelors, Even* (1915–1923). Despite the apparent graphic insignificance of the originals, Thirkell (2005) describes how the *Green Box* exercised considerable precision in their reproduction:

> "Instead of using a photographic colour separation technique (as was common in Germany at the time), the pochoir stencil colouring process was used. This involved printing a key collotype image in black ink and overlaying specially cut copper stencils which were used as a guide for the application of hand-rendered watercolour washes. Although this sounds relatively primitive, the detail of the continuous-tone collotype image combined with — in many cases a multitude of subtly layered colour washes — produced an image remarkably similar to the original. This was especially true for works on paper. Collotype was also flexible enough to print onto a variety of paper stocks and Duchamp capitalised on this by 'scouring Paris' in his words looking for paper to match as closely as possible his original

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[33] Maurice Goldring, 'Rational Typographic Design', a paper given at the 1966 *International Computer Typesetting* conference, and used as a type specimen in *Dimensional relationships in the composition of text* (Stafford College of Art and Design, 1970).

> notes. Not only did he match the paper but he also created a series of templates allowing the prints to be torn around their edges to replicate the shape of the scraps of paper on which the notes were originally written."[34]

Academic and artistic interest in reproducing, translating, and decoding Duchamp's notes has endured. The first canonical print version of the texts was published in French in 1959, in *Marchand du Sel*, an anthology of Duchamp's writings. This book's conventional linear typography entirely foresakes the unruly graphic characteristics of the originals, offering only bibliographic descriptions of their appearance in numerous footnotes (FIG. 4.6.1, 4.6.2). The same approach had been used in an earlier, partial, English translation, by Jacob Bronowski that appeared in 1932 (FIG. 4.6.3). A typical Bronowski footnote reads:

> "This word in the manuscript is ringed in red, and has the note 'perhaps nothing,' written against it."[35]

The first substantial English publication of the *Green Box* texts appeared in 1957 as *From the Green Box*, a small format hardcover book, edited, and translated by George Heard Hamilton, an art history professor at Yale University (FIG. 4.6.4, 4.6.5, 4.6.6).[36] In this volume, Duchamp's texts resemble poems, perfunctorily typeset by Henry Steiner. In his preface, Heard Hamilton disclaims this typography:

> "In preparing the translation we have tried to preserve as much of the appearance of the original manuscript notes as typography permits."[37]

This statement seems meant with irony, given Steiner's radical simplification of the graphically undisciplined notes into a conventionally elegant volume of poetry. *From the Green Box* is *only* a textual translation. The use of italic type throughout, presumably for its closer resemblance to handwriting, and the

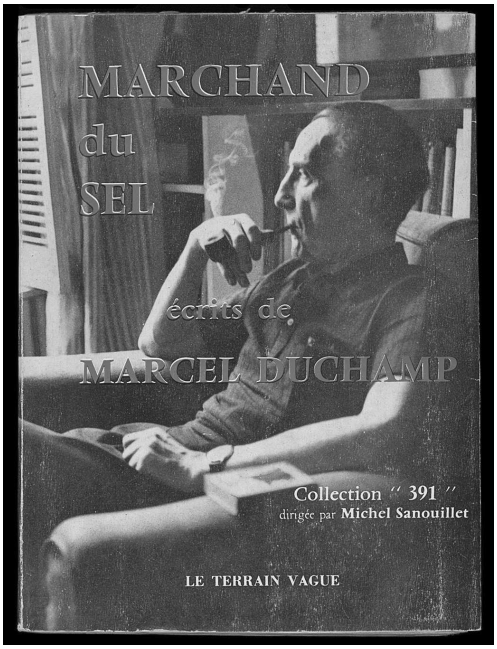
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34 Paul Thirkell, 'From the Green Box to Typo/Topography: Duchamp and Hamilton's Dialogue in Print', in *Tate Papers* (Spring 2005).

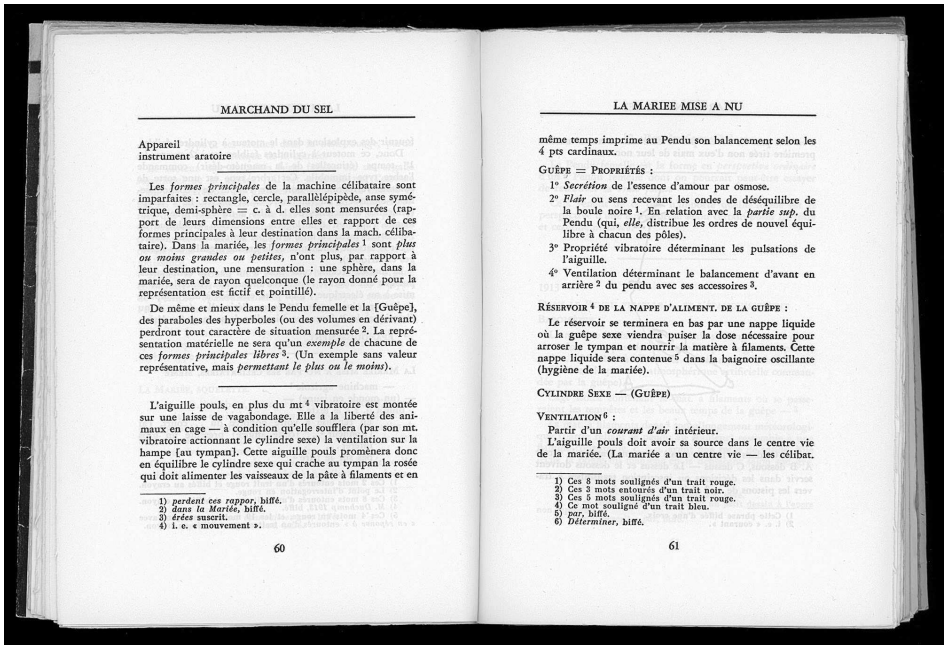
35 Bronowski, reproduced in Richard Hamilton, *Collected Words* (Thames & Hudson), 185.

36 George Heard Hamilton, *From the Green Box* (The Readymade Press, 1957). As Richard Hamilton notes in 'Towards a typographical rendering of the Green Box', there had been three smaller extracts published in periodicals in the 1930s and 1940s.

37 Heard Hamilton, *From the Green Box*, 3.



4.6.1. Marcel Duchamp, *Marchand du Sel.*



MARCHAND DU SEL

Appareil
instrument aratoire

Les *formes principales* de la machine célibataire sont imparfaites : rectangle, cercle, parallèlépipède, anse symétrique, demi-sphère = c. à d. elles sont mensurées (rapport de leurs dimensions entre elles et rapport de ces formes principales à leur destination dans la mach. célibataire). Dans la mariée, les *formes principales* [1] sont *plus ou moins grandes ou petites*, n'ont plus, par rapport à leur destination, une mensuration : une sphère, dans la mariée, sera de rayon quelconque (le rayon donné pour la représentation est fictif et pointillé).

De même et mieux dans le Pendu femelle et la [Guêpe], des paraboles des hyperboles (ou des volumes en dérivant) perdront tout caractère de situation mensurée [2]. La représentation matérielle ne sera qu'un *exemple* de chacune de ces *formes principales libres* [3]. (Un exemple sans valeur représentative, mais *permettant le plus ou le moins*).

L'aiguille pouls, en plus du mt [4] vibratoire est montée sur une laisse de vagabondage. Elle a la liberté des animaux en cage — à condition qu'elle soufflera (par son mt. vibratoire actionnant le cylindre sexe) la ventilation sur la hampe [au tympan]. Cette aiguille pouls promènera donc en équilibre le cylindre sexe qui crache au tympan la rosée qui doit alimenter les vaisseaux de la pâte à filaments et en

1) *perdent ces rappor*, biffé.
2) *dans la Mariée*, biffé.
3) *drées sunerit.*
4) l. e. « mouvement ».

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LA MARIEE MISE A NU

même temps imprime au Pendu son balancement selon les 4 pts cardinaux.

GUÊPE = PROPRIÉTÉS :

1° *Secrétion* de l'essence d'amour par osmose.
2° *Flair* ou sens recevant les ondes de déséquilibre de la boule noire [1]. En relation avec la *partie sup.* du Pendu (qui, *elle*, distribue les ordres de nouvel équilibre à chacun des pôles).
3° Propriété vibratoire déterminant les pulsations de l'aiguille.
4° Ventilation déterminant le balancement d'avant en arrière [2] du pendu avec ses accessoires [3].

RÉSERVOIR [4] DE LA NAPPE D'ALIMENT. DE LA GUÊPE :

Le réservoir se terminera en bas par une nappe liquide où la guêpe sexe viendra puiser la dose nécessaire pour arroser le tympan et nourrir la matière à filaments. Cette nappe liquide sera contenue [5] dans la baignoire oscillante (hygiène de la mariée).

CYLINDRE SEXE — (GUÊPE)

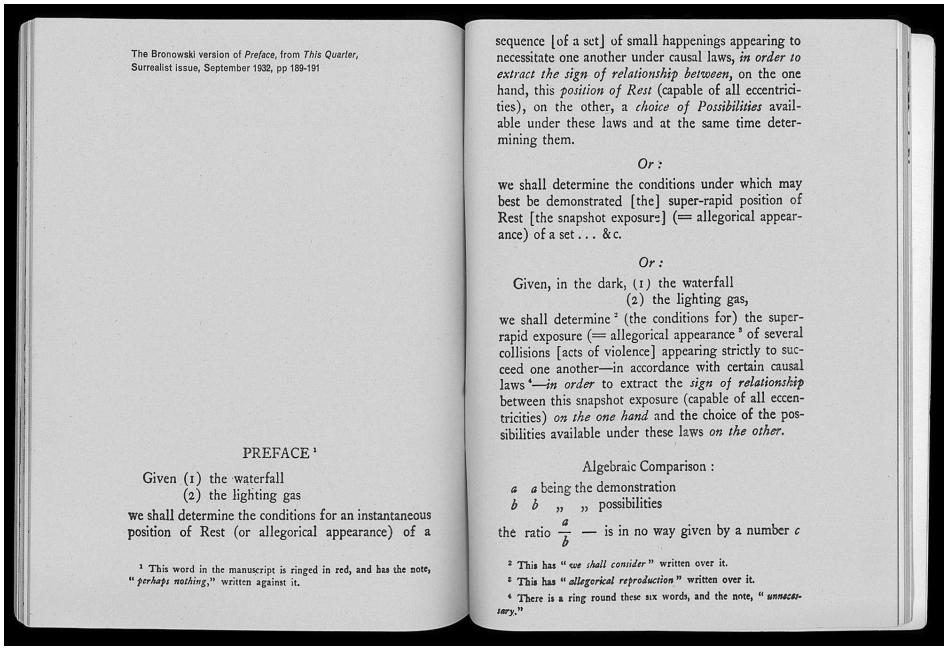
VENTILATION [6] :

Partir d'un *courant d'air* intérieur.
L'aiguille pouls doit avoir sa source dans le centre vie de la mariée. (La mariée a un centre vie — les célibat.

1) Ces 8 mots soulignés d'un trait rouge.
2) Ces 2 mots entourés d'un trait noir.
3) Ces 5 mots soulignés d'un trait rouge.
4) Ce mot souligné d'un trait bleu.
5) *par*, biffé.
6) *Déterminer*, biffé.

61

4.6.2. Duchamp, *Marchand du Sel*, text transcribed from notes.



The Bronowski version of *Preface*, from *This Quarter*, Surrealist issue, September 1932, pp 189-191

PREFACE [1]

Given (1) the waterfall
(2) the lighting gas
we shall determine the conditions for an instantaneous position of Rest (or allegorical appearance) of a sequence [of a set] of small happenings appearing to necessitate one another under causal laws, *in order to extract the sign of relationship between*, on the one hand, this *position of Rest* (capable of all eccentricities), on the other, a *choice of Possibilities* available under these laws and at the same time determining them.

Or :

we shall determine the conditions under which may best be demonstrated [the] super-rapid position of Rest [the snapshot exposure] (= allegorical appearance) of a set . . . &c.

Or :

Given, in the dark, (1) the waterfall
(2) the lighting gas,
we shall determine [2] (the conditions for) the super-rapid exposure (= allegorical appearance [3] of several collisions [acts of violence] appearing strictly to succeed one another—in accordance with certain causal laws [4]—*in order* to extract the *sign of relationship* between this snapshot exposure (capable of all eccentricities) *on the one hand* and the choice of the possibilities available under these laws *on the other.*

Algebraic Comparison :

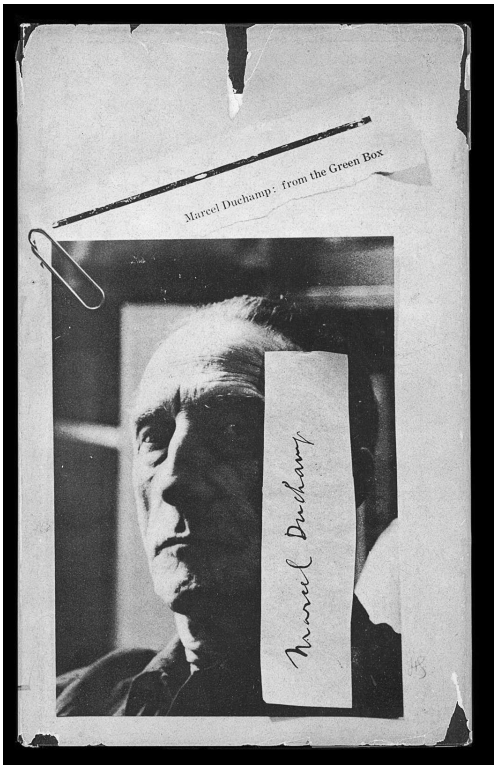
a a being the demonstration
b b „ „ possibilities

the ratio $\frac{a}{b}$ — is in no way given by a number c

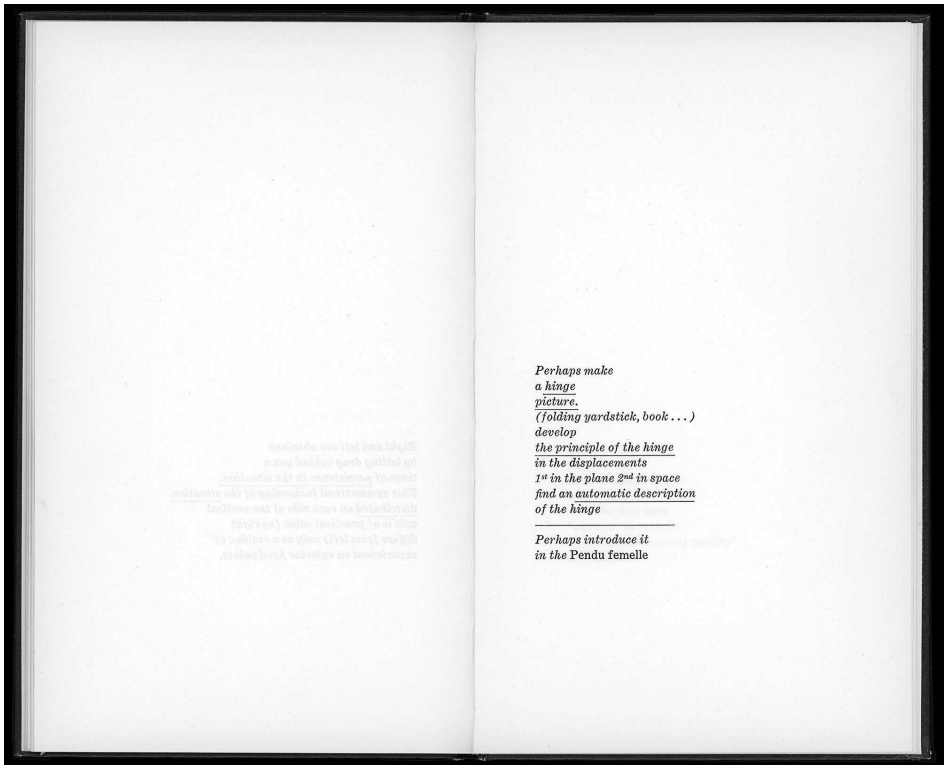
[1] This word in the manuscript is ringed in red, and has the note, "*perhaps nothing*," written against it.

[2] This has "*we shall conider*" written over it.
[3] This has "*allegorical reproduction*" written over it.
[4] There is a ring round these six words, and the note, "*unnecessary.*"

4.6.3. Duchamp, Jacob Bronowski translation, reproduced in *Uppercase* magazine.



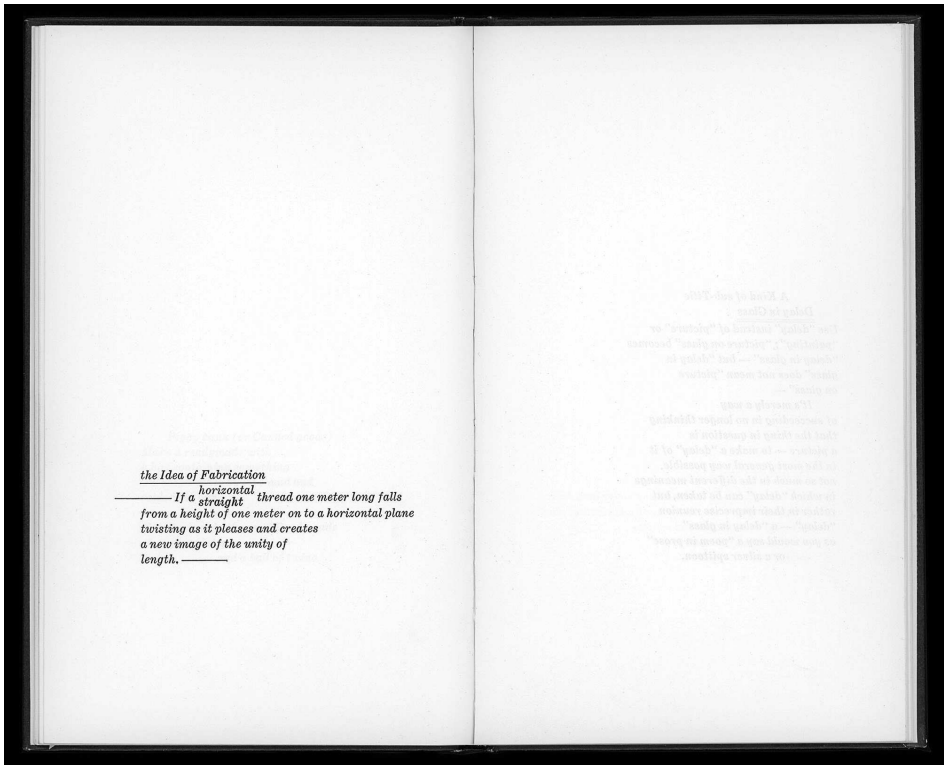
4.6.4. Marcel Duchamp, *From the Green Box*.



Perhaps make
a hinge
picture.
(folding yardstick, book . . .)
develop
the principle of the hinge
in the displacements
1st in the plane 2nd in space
find an automatic description
of the hinge

Perhaps introduce it
in the Pendu femelle

4.6.5. Duchamp, *From the Green Box*, notes typeset to resemble poems.



the Idea of Fabrication

——— *If a* horizontal / straight *thread one meter long falls*
from a height of one meter on to a horizontal plane
twisting as it pleases and creates
a new image of the unity of
length. ———

4.6.6. Duchamp, *From the Green Box*.

occasional variations in letter spacing, are the only minor visual concessions made to the original's formal specificity.

Three years later, British artist Richard Hamilton would describe his approach to publishing the *Green Book* (FIG. 4.6.7, 4.6.8), a comprehensive English version of Duchamp's *Green Box* ephemera, with new translations by Heard Hamilton, as "typotranslation".[38] Typotranslation combined a highly idiosyncratic set of graphic and typographic devices in an attempt to convey the fullest possible range of Duchamp's meanings, and especially the provisional nature of his mark-making. Hamilton asserted the graphic significance of the originals:

> "Some flicker like a momentary thought; some have been returned to again and again: erasures, underlining, stresses and amendments abound — modulations of an idea are sometimes revealed by a calligraphic sign — subtle inflexions may be apparent only in a difference of writing instrument."[39]

Hamilton, an accomplished artist and printmaker himself, would make regular, labour-intensive, detours into graphic design and typography during his career, most notably in relation to Duchamp, who referred to him as "mon grand déchiffreur".[40] Maharaj (1996) documents the close and extensive correspondence between Hamilton and Duchamp during the preparation of the *Green Book*:

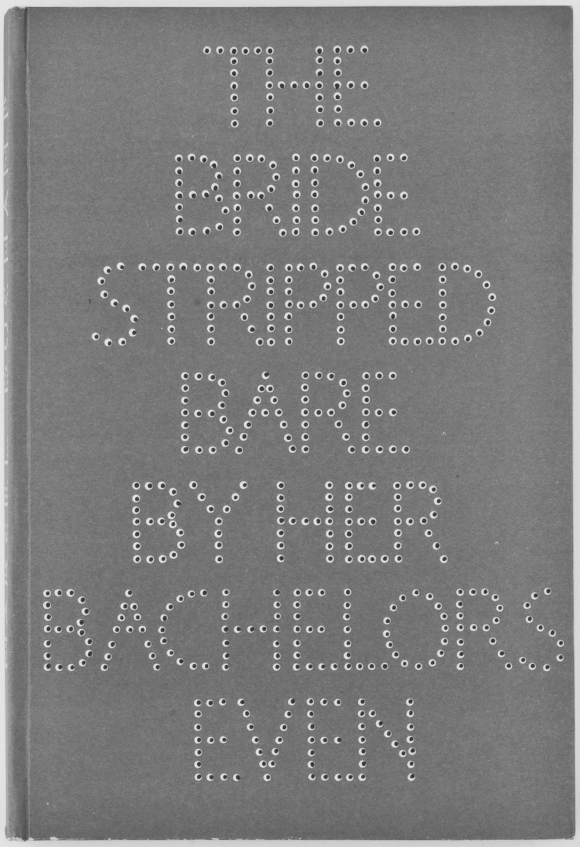
> "He spelled out the task in his first exchange with Duchamp: 'Translating from the French, as I see it, is not the difficult part of the project. I fancy that the major problems will occur in translating the extremely subtle inflections of ideas in the *Green Box* into cold print. It is at the typographical level that the real work begins — communication of the ideas via printer's signs, instead of the hand-drawn signs of the facsimiles.' If print meant that 'the hand is necessarily removed from the text,' he wrote to Duchamp in the thick of the task in 1958, should not the marginal drawings also be recast for consistency's sake? Otherwise text and image become 'divorced' when the point was to reflect their 'perfect marriage' in the manuscript. Throughout we feel the twin

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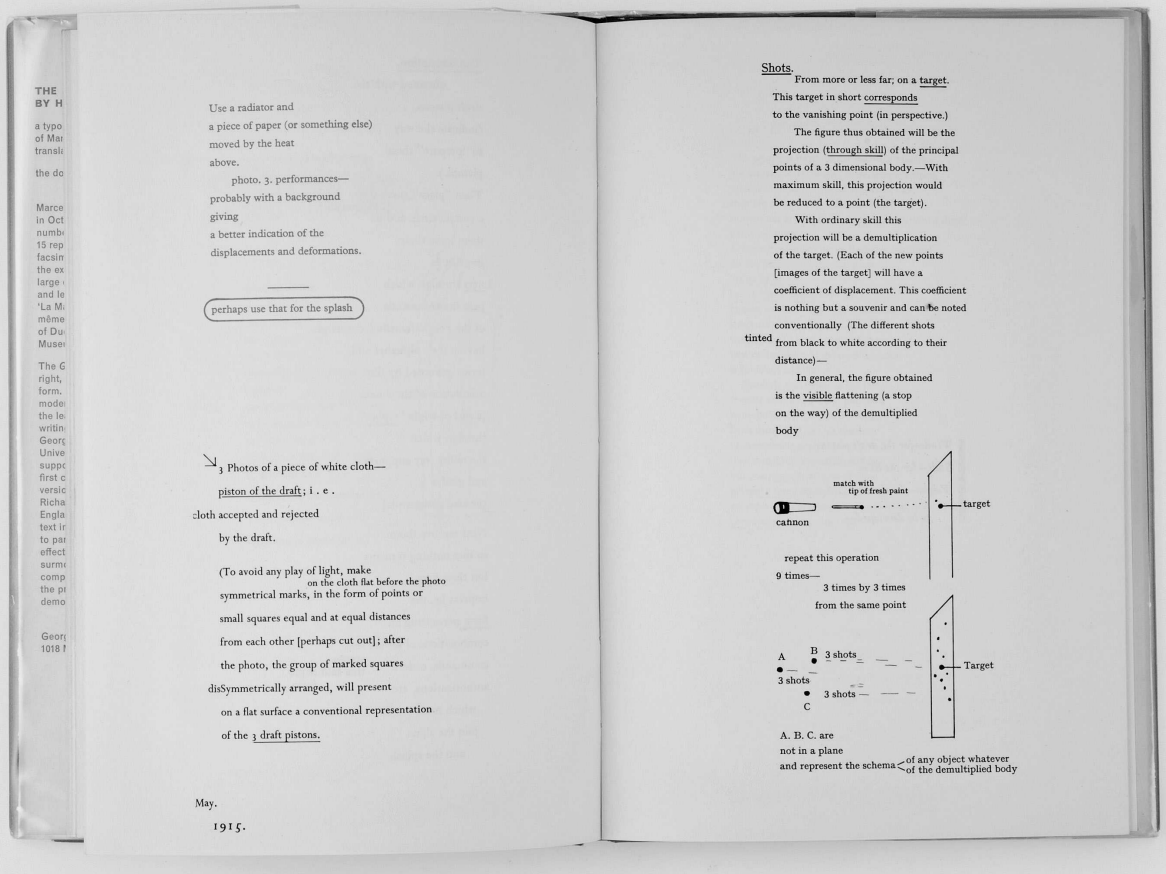
38 Hamilton and Heard Hamilton are no relation.

39 Hamilton, *Collected Words*, 183.

40 Sarat Maharaj, '"A Monster of Veractiy, a Crystalline Transubstantiation": Typotranslating the Green Box', *The Duchamp Effect* (October, 1996), 72.



4.6.7. Marcel Duchamp, *Green Book*, Richard Hamilton typotranslation.



Use a radiator and
a piece of paper (or something else)
moved by the heat
above.
photo. 3. performances—
probably with a background
giving
a better indication of the
displacements and deformations.

perhaps use that for the splash

3 Photos of a piece of white cloth—
piston of the draft; i . e .
cloth accepted and rejected
by the draft.

(To avoid any play of light, make
on the cloth flat before the photo
symmetrical marks, in the form of points or
small squares equal and at equal distances
from each other [perhaps cut out]; after
the photo, the group of marked squares
disSymmetrically arranged, will present
on a flat surface a conventional representation
of the 3 draft pistons.

May.
1915.

Shots.
From more or less far; on a target.
This target in short corresponds
to the vanishing point (in perspective.)
The figure thus obtained will be the
projection (through skill) of the principal
points of a 3 dimensional body.—With
maximum skill, this projection would
be reduced to a point (the target).
With ordinary skill this
projection will be a demultiplication
of the target. (Each of the new points
[images of the target] will have a
coefficient of displacement. This coefficient
is nothing but a souvenir and can be noted
conventionally (The different shots
tinted from black to white according to their
distance)—
In general, the figure obtained
is the visible flattening (a stop
on the way) of the demultiplied
body

match with
tip of fresh paint
cannon
target

repeat this operation
9 times—
3 times by 3 times
from the same point

A
B
3 shots
3 shots
3 shots
C
Target

A. B. C. are
not in a plane
and represent the schema of any object whatever
of the demultiplied body

4.6.8. Duchamp, *Green Book*, Richard Hamilton typotranslation.

> concern — transposing everything into print terms while holding onto the original's aura of an 'integrated whole.'"[41]

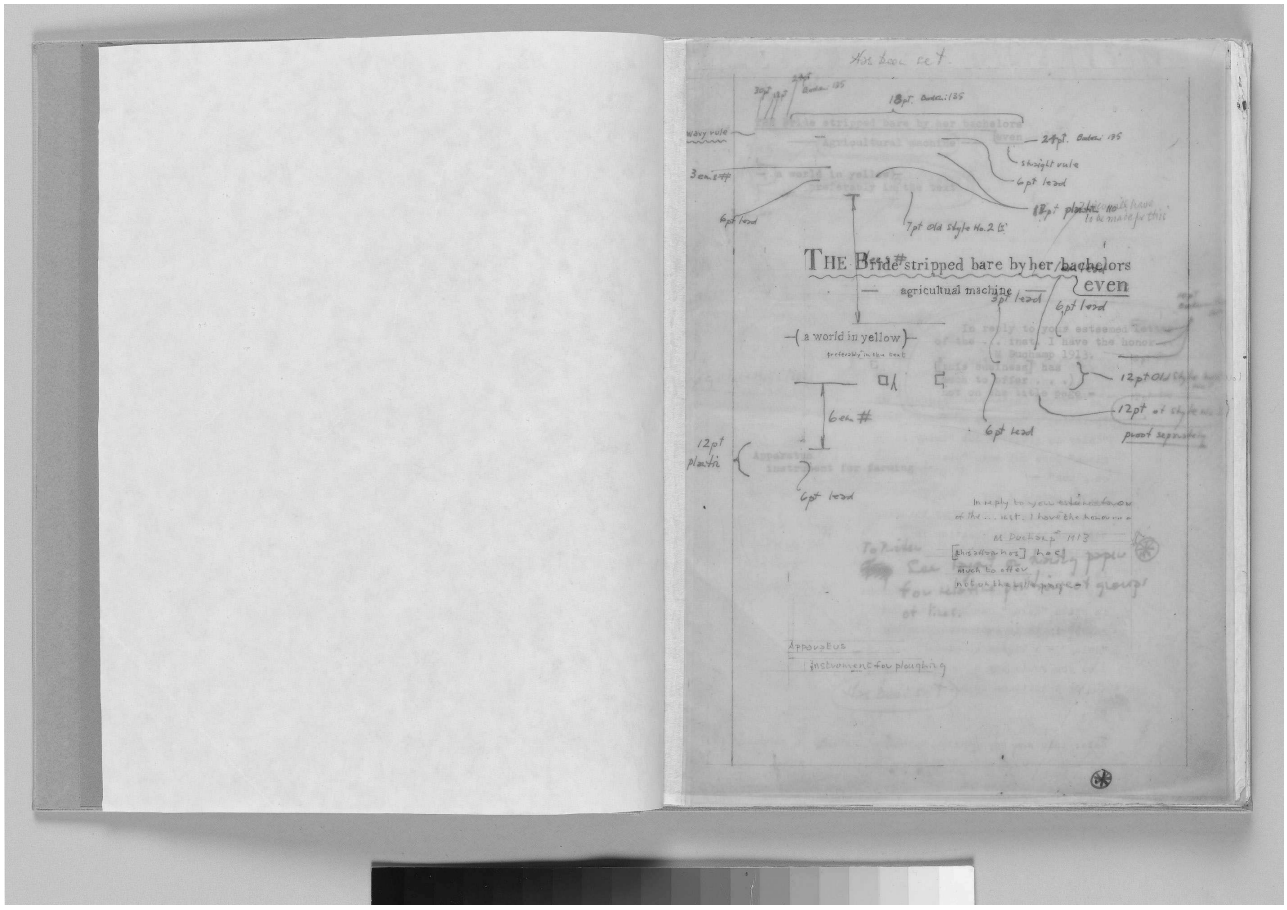
Examples of Hamilton's paste-up artwork, and sample typesettings of sections of the *Green Book*, are in the Sohm Archive at the Staatsgalerie Stuttgart, Germany. These show the extraordinary graphic labour involved in the task of typotranslating Duchamp's "integrated whole" using the hardware of mid-century letterpress printing. Hamilton had to type each line of text on a typewriter, cut it to show precisely the intended line-ending and composition, and then specify in which typeface and size it should be set, according to an intricate scheme that he had devised to correspond with different styles of handwriting in Duchamp's originals (FIG. 4.6.9, 4.6.10). The work would have been immensely time-consuming and complicated. Hamilton's project could not have been more untimely and at odds with the mechanisms of print, optimised as they were for the setting of continuous lines of prose in a single typeface, at a single size, in a single page format. However, despite this, and despite Hamilton's admissions that "this obsessive attitude towards the setting may seem ludicrous in face of the increased obscurity of the result", and that the entire project "may seem pedantic to the point of fanaticism", the *Green Book* was an emphatic success in Duchamp's estimation.[42] The artist called it a "monster of veracity".[43]

Hamilton returned to the typotranslation of Duchamp again in the 1990s, in collaboration with Jackie Matisse and Ecke Bonk as translators and researchers.[44] The technical transformation of graphic design by the introduction of digital typography and desktop publishing in the intervening four decades would make this an altogether more autonomous and manageable exercise, if no less involved. In 1999, *à l'infinitif* was published, as a typotranslation of another graphically complex collection of Duchamp ephemera, the *White Box*, from 1967 (FIG. 4.6.11).

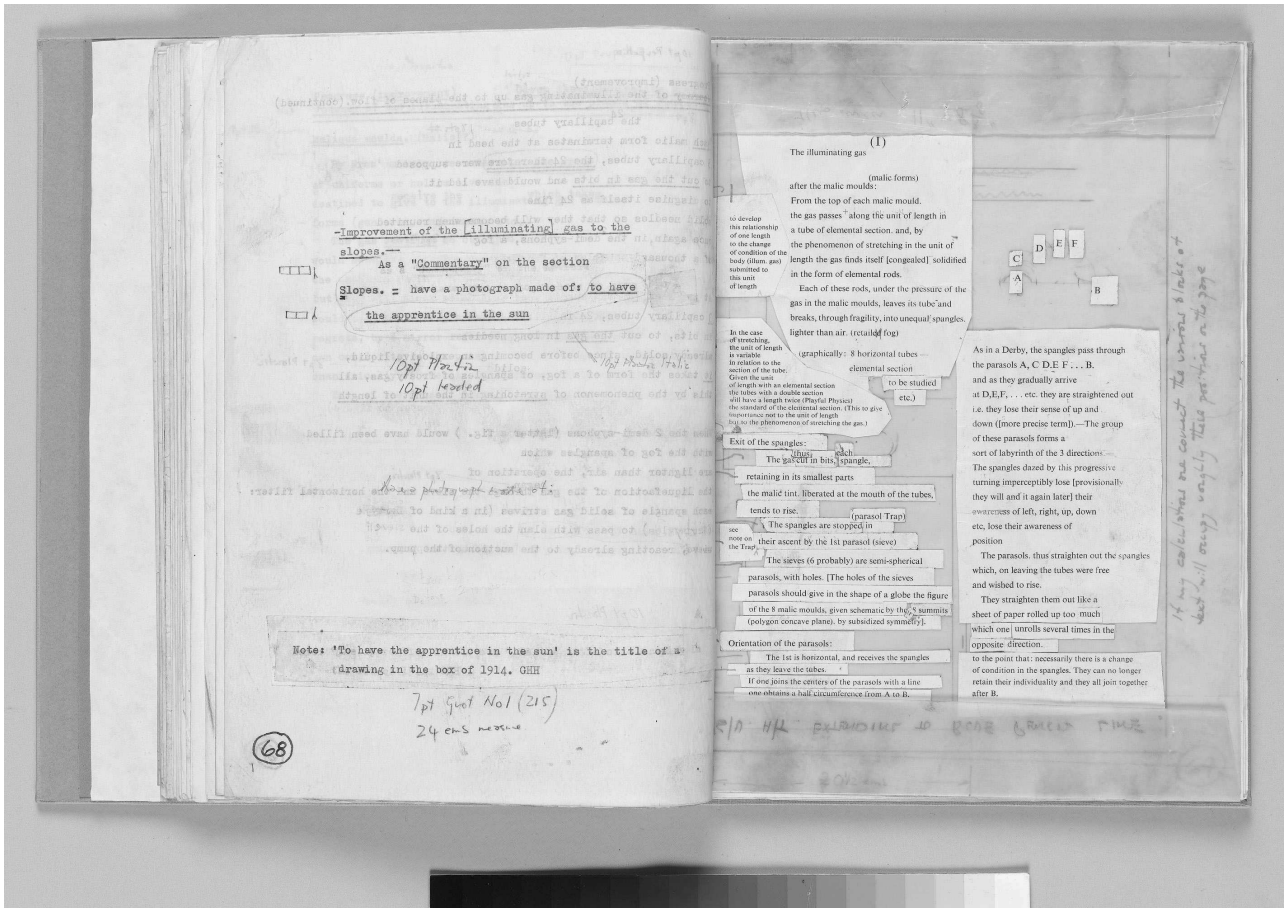
Design historian Rick Poynor interviewed Hamilton on the subject of this project in 2000. Poynor, writing for *Eye* magazine, under the heading 'A new typographic isomorph', introduced Hamilton's project as follows:

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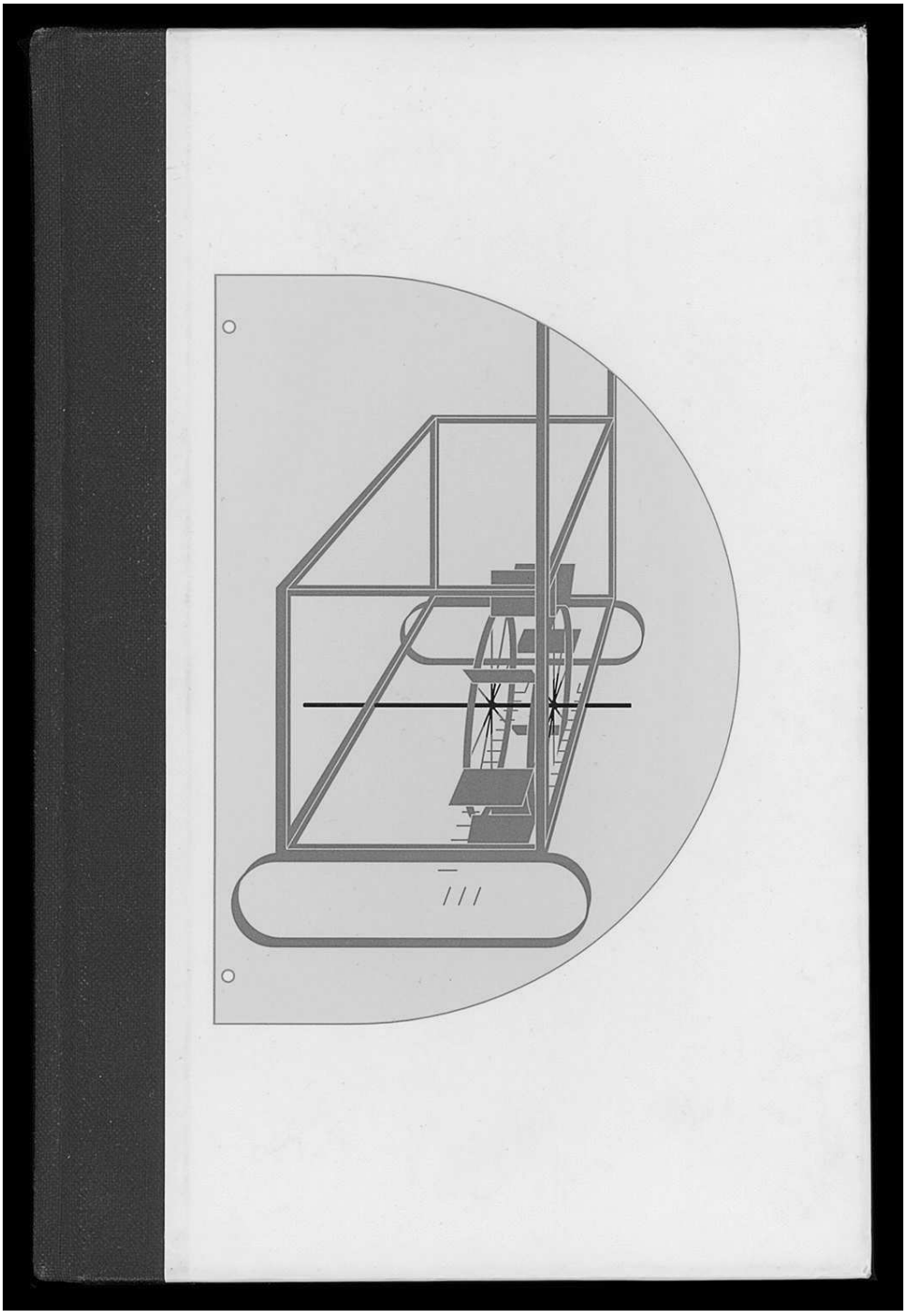
41 Maharaj, *The Duchamp Effect* , 64.
42 Hamilton, *Collected Words*, 189, 196.
43 Quoted in Maharaj, 76.
44 Duchamp died in 1968.



4.6.9. Richard Hamilton, artwork and specification for the *Green Book*.
Staatsgalerie Stuttgart, Archiv Sohm.



4.6.10. Hamilton, artwork and specification for the *Green Book*.
Staatsgalerie Stuttgart, Archiv Sohm.



4.6.11. Marcel Duchamp, *à l'infinitif*.

> "Previous attempts to edit and streamline Duchamp's jottings into tight, linear, regularised typographic form always seemed to compromise and betray the free play of thought in the original notes, sketches and diagrams. Duchamp evidently understood this when he chose to publish them in facsimile form. As with the *Green Book*, Hamilton's aim with *à l'infinitif* was to create a new typographic and graphic 'isomorph' of the original. ... The widely letter-spaced, super-elastic typography, with continuous modulations of type size, type style, ink colour, indentation, line-spacing and line width, gives their pages a typographic character that has few obvious precedents. … Yet the eccentricities of form are always grounded in the need to transliterate the original with the utmost faithfulness and lucidity."[45]

In the introduction to *à l'infinitif*, Hamilton himself describes the exercise as *requiring* a liberation from the constraints of typesetting and printing hardware:

> "Since the publication of the *Green Book* in 1960, advances in computer science have brought a transformation in the dissemination of ideas of greater consequence than that introduced by Gutenberg and Caxton with the invention of moveable type. Publishing software has removed many of the limitations fundamental to letterpress printing and the complex project of rendering Duchamp's notes in English can now be undertaken in an environment in which the writer/translator/typographer/designer is free to move over the hypothetical platen of the press unhindered. QuarkXPress provides typesetting resources with limitless possibilities of text control. Bézier curves can translate Duchamp's intensely personal graphic expression into mathematically defined lines in harmony with the objectivity of type. The very existence of these new tools invited an attempt to open the *White Box* to an audience that had found the *Green Box* typotranslation useful."[46]

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45 Rick Poynor, 'Typotranslation', *Eye* no. 38 (2000). Rick Poynor clarified by email that the word isomorph was used by Hamilton explicitly in their conversation.

46 Richard Hamilton, *à l'infinitif* (Typosophic Society, 1999).

In the preparation of *à l'infinitif*, Ecke Bonk closely examined Duchamp's original handwritten notes at the Museum of Modern Art (MoMA) in New York. Hamilton's typotranslation could therefore establish fidelity with those originals, instead of the collotyped reproductions published in 1967. On this distinction, Hamilton writes:

> "Readers familiar with the facsimiles may be surprised to find variations of colour and other differences in this typographic version of the notes ... The 'facsimiles' of the limited edition of the *White Box* are not, as defines that word, 'an exact copy'. The collotype reproductions are a single printing in black on a standard weight and colour of paper."[47]

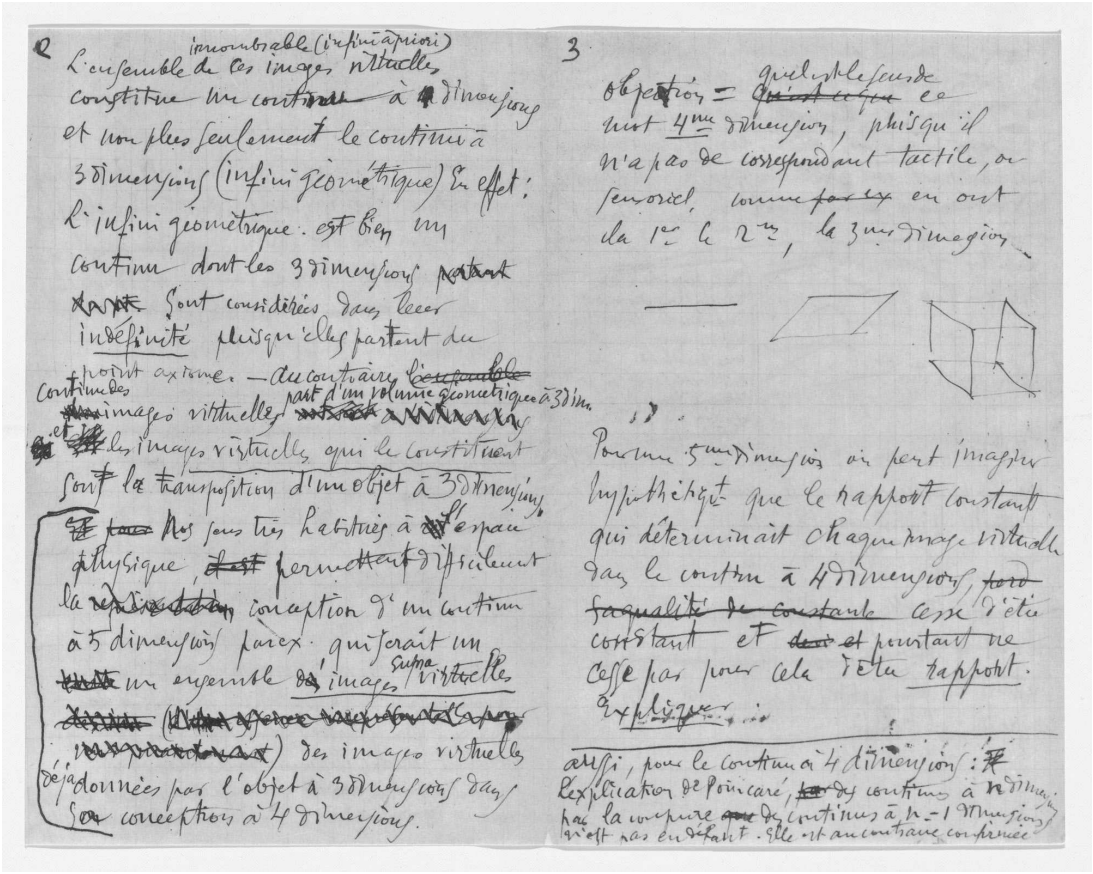
Notwithstanding these differences, it is possible to compare the compositional aspects of Hamilton's typotranslations with reproductions of the original *White Box* ephemera that appear on MoMA's collections website. *à l'infinitif* includes commentaries — called "rubrics" by Hamilton — on individual notes. These reveal the considerations that informed specific design decisions. In many cases, digitisation seems to have the effect of tidying up minor disparities. For example, note 77 relates three simple linear representations of the first, second and third dimensions — respectively a horizontal line, a parallelogram, and a cube (FIG. 4.6.12).[48] In the photograph of the collotyped version of this note at the MoMA website, Duchamp's parallelogram has reasonably precise connections of its four vectors at three of their four terminals. In the bottom right terminal, though, the horizontal line extends noticeably beyond perfect alignment. Hamilton's typotranslation corrects this and renders a perfectly aligned parallelogram (FIG. 4.6.13). The same treatment is used for the third dimension — Duchamp's cube is rough, with all of its vectors either crossing or ending short of meeting at each of the eight terminals; Hamilton's is perfectly conjoined.

Note 83 is treated fractionally differently. Here, there is a similar parallelogram, amidst other graphic elements. In Duchamp's sketch, two of the parallelogram's vectors overshoot their terminals: one horizontally and one vertically. These overshoots are comparable to the single, over-extended line in item 77, yet Hamilton chooses to preserve them in this case.

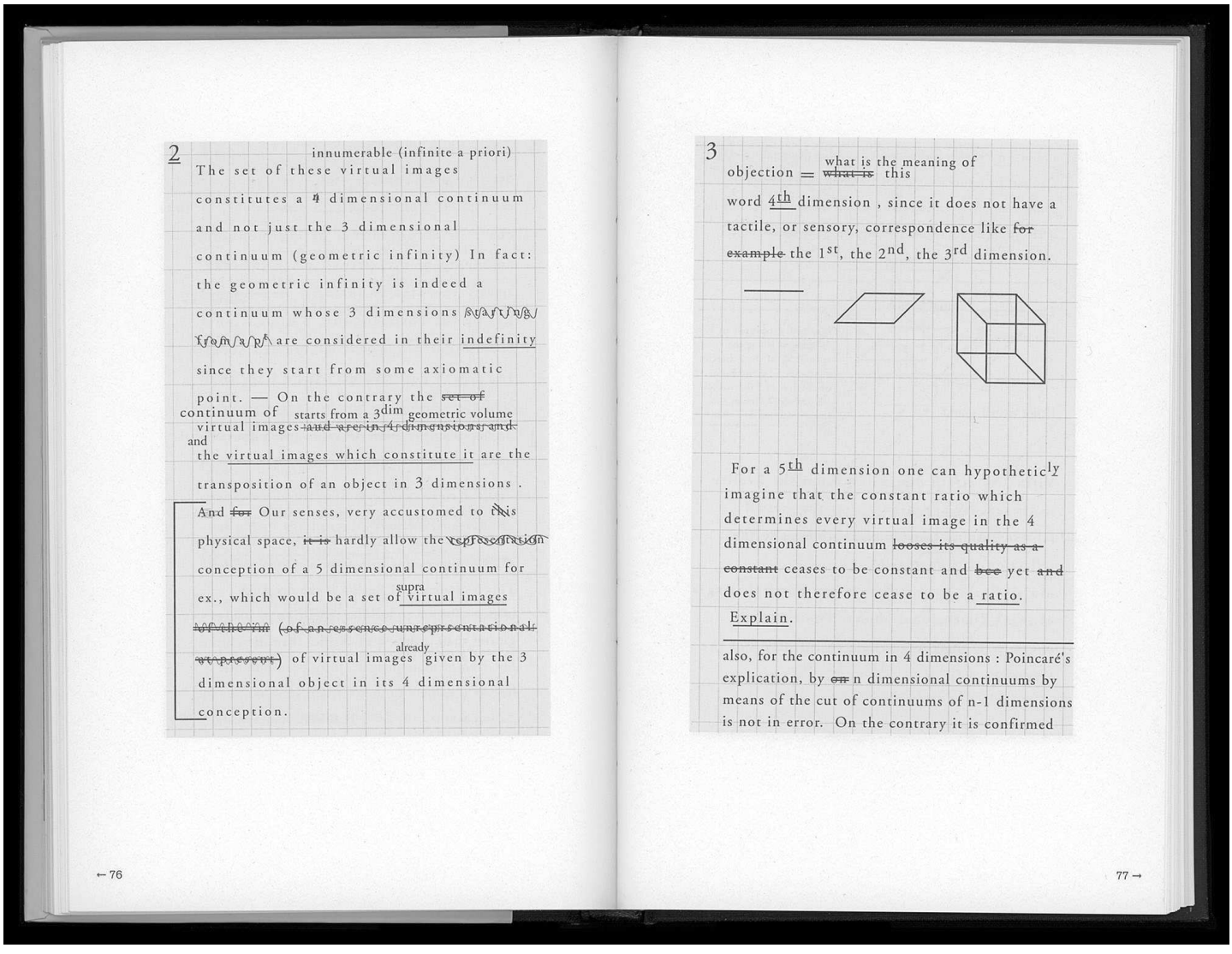
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47 Hamilton, *à l'infinitif*.

48 Duchamp's originals have no defined order, but in Hamilton's scheme this is note 77.



4.6.12. Marcel Duchamp, collotype note.
Museum of Modern Art.



4.6.13. Duchamp, *à l'infinitif*, Richard Hamilton typotranslation, note 77.

Note 111 has an opening paragraph of text that has been scribbled out (FIG. 4.6.14). The scribble follows a loose vector over the area of the paragraph and is graphically quite distinct from the close hatching used to completely obscure other words on the same note. It would seem to conform to Hamilton's assertion that "preserving the deletions and insertions reveals the development of ideas — even erratic spacing and punctuation can contribute to our understanding of the flow of thought".[49] The typotranslation of this scribbled vector *almost* follows its form, but not precisely (FIG. 4.6.15). This is difficult to explain. Even if Hamilton had tried to reproduce not the curve of the vector, but the precise points of contact between it and individual words, his typotranslation would still be imprecise. For example, in its lower right corner, Duchamp's line loops around the word "4dmsl", while in the corresponding typotranslation the loop completely misses that word.

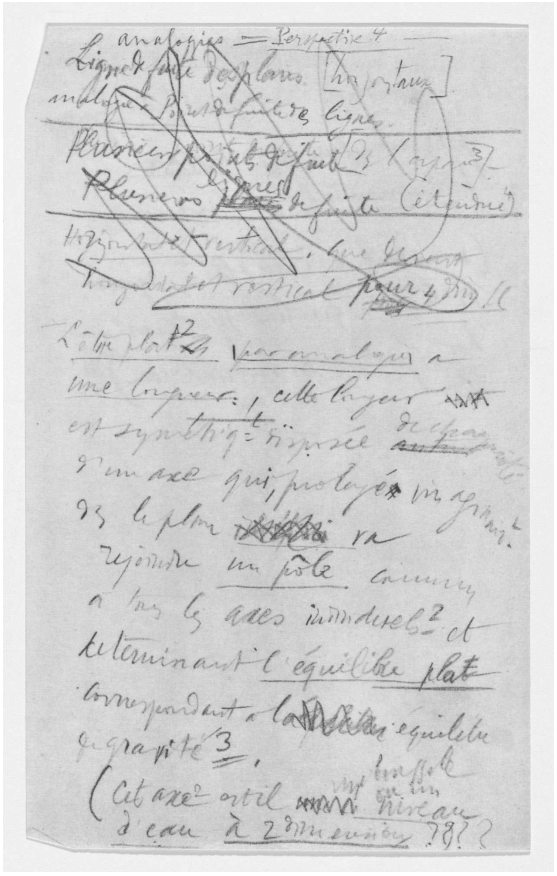
These pedantic comparisons demonstrate how any judgement about the threshold between meaningful and incidental marks becomes hopelessly fractal. Digital line unavoidably conveys certainty, and software tends to institute the resolution of forms. It *wants* to connect loose vector points. It *wants* shapes to align. Inevitably, some artefacts of the work having been subject to such inescapable digital precision remain. Duchamp's sketches in notes 51 and 53 are not typotranslated but appear as integrated scans of the original drawings (FIG. 4.6.16, 4.6.17). This would suggest that the original sketches were considered too pictorial, or perhaps too expressive, to be translated into type without introducing distraction and misrepresentation. Typotranslation's "integrated whole" actually only admits text and drawing.

Contemporaneously with Hamilton's work on the *Green Book*, Swiss artist Serge Stauffer was preparing typographic translations of Duchamp's notes into German (although Stauffer's would not be published until 1981). Maharaj dismisses these, claiming that Stauffer "renders everything captive to Gutenberg", but Stauffer's approach does in fact articulate a position with respect to the transformation of gestural, provisional line into typographic certainty.[50] Stauffer employs only a single typeface, with normal letter spacing, and only very occasional variations in type size. He presents Duchamp's drawings as what appear to be scans from the collotyped reproductions, overlaid directly on his typography and reproduced in a relatively crude monotone black.

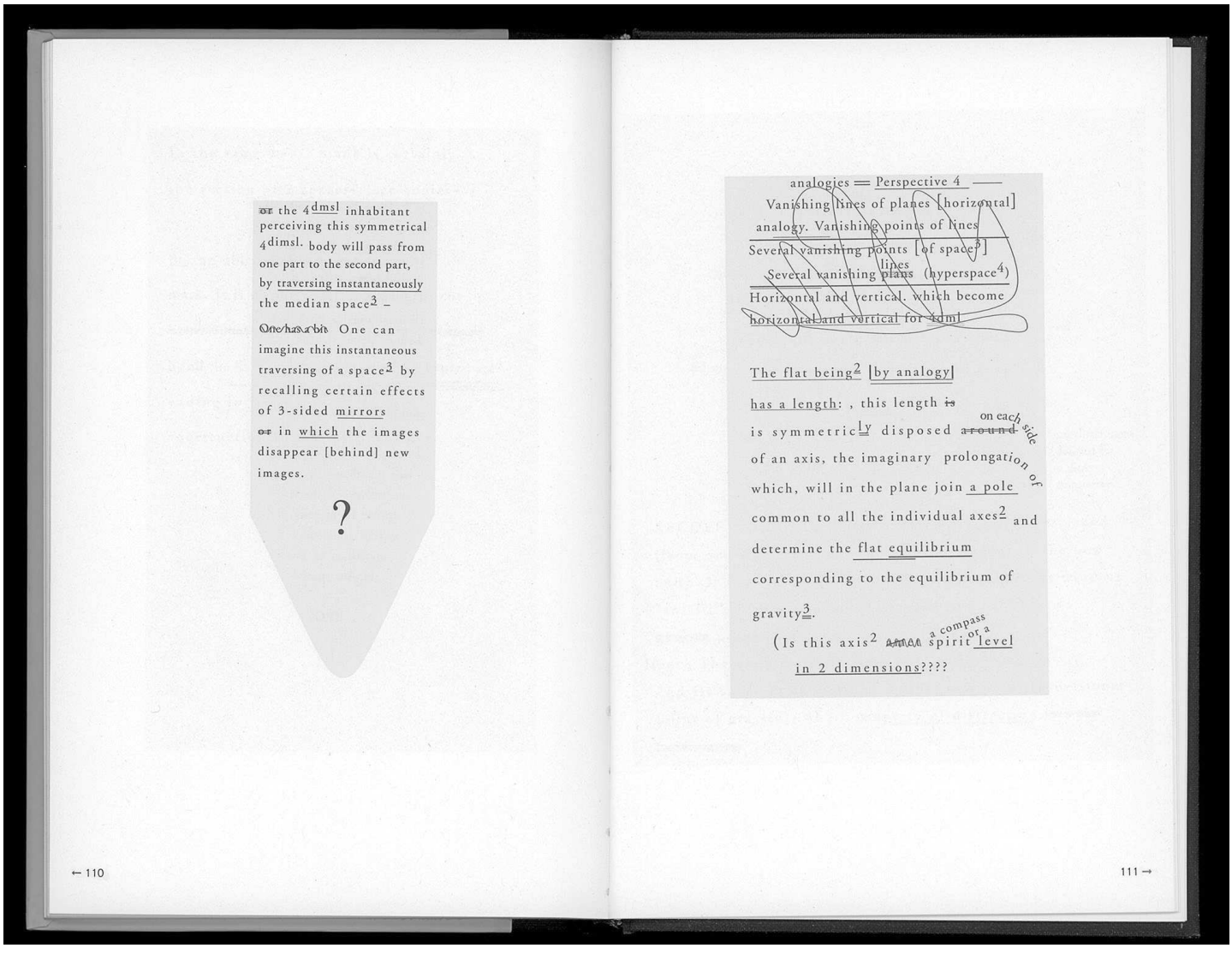
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49 Hamilton, *à l'infinitif*.

50 Maharaj, *The Duchamp Effect* , 75.



4.6.14. Marcel Duchamp, collotype note. Museum of Modern Art.



or the 4dmsl inhabitant perceiving this symmetrical 4dimsl. body will pass from one part to the second part, by traversing instantaneously the median space3 –

~~On has a bi~~ One can imagine this instantaneous traversing of a space3 by recalling certain effects of 3-sided mirrors

~~or~~ in which the images disappear [behind] new images.

?

← 110

analogies = Perspective 4 ——

Vanishing lines of planes [horizontal] analogy. Vanishing points of lines

Several vanishing points [of space3]

lines

Several vanishing plans (hyperspace4)

Horizontal and vertical. which become horizontal and vertical for 4dm]

The flat being2 [by analogy]

has a length: , this length ~~is~~ is symmetricly disposed ~~around~~ on each side of an axis, the imaginary prolongation of which, will in the plane join a pole common to all the individual axes2 and determine the flat equilibrium corresponding to the equilibrium of gravity3.

(Is this axis2 ~~a~~ a compass or a spirit level in 2 dimensions????

111 →

4.6.15. Duchamp, *à l'infinitif*, Richard Hamilton typotranslation, note 111.

Kaufmann (2019) refers to a "rivalry" between Hamilton and Stauffer, who both sought Duchamp's approval for their work in the late 1950s.[51] Her assessment of the differences between the two approaches is brief:

> "While Hamilton made deliberate efforts to remain 'impersonal' in his style and also simplified Duchamp's drawings, Stauffer exercised much less self-restraint in his annotated translation."[52]

To compare the two on the basis of the degree of personal intervention betrayed in their typography is misleading. It might be accurate to describe Hamilton's typotranslation as "impersonal" and "simplified", but its methodology is arguably more interpretive that Stauffer's. The visuality of Stauffer's pages is immediate, and livelier than Hamilton's. The content of the note numbered 77 by Hamilton appears on a single, large-format page of Stauffer's *Marcel Duchamp, Die Schriften* (4.6.18, 4.6.19). There is no indication of the format or quality of the original's substrate. The graphics, including the line, parallelogram, and cube described above, are demonstrably from a scan of the collotype consistent with the example shown at the MoMA website. Their quality of line is not fine or precious, but utilitarian in lieu of the originals. While these scans give a greater sense of contact with the original, hand-drawn forms than do Hamilton's digital vectors, I would argue that their use had the consequence of radically reducing the number and nuance of interpretive micro-decisions that Stauffer was required to make in the preparation of his edition.

Duchamp simultaneously encouraged the two approaches, responding to a sample of Stauffer's work in 1958:

> "The little typographical attempt you sent me is as close to the original as a printed text can ever be."[53]

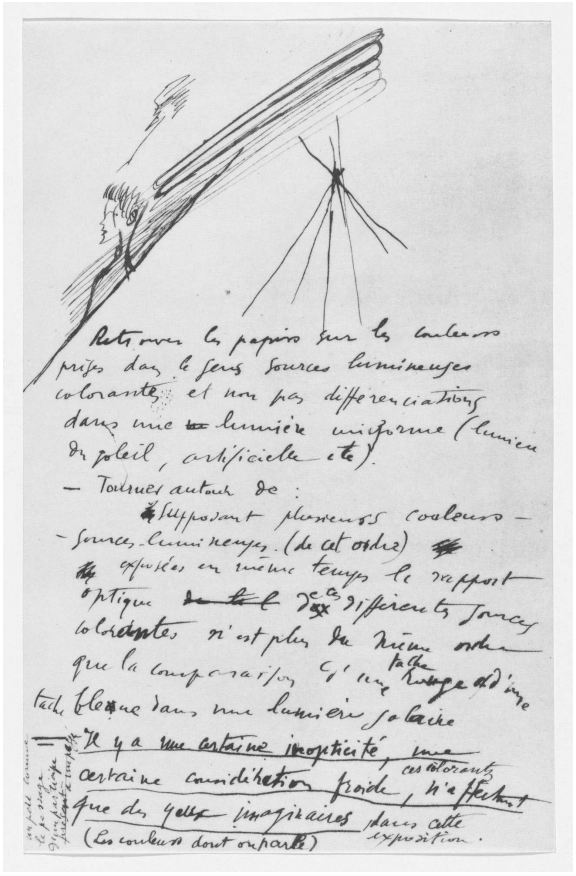
Hamilton's and Stauffer's typotranslations can both be understood as isomorphs, in the mathematical sense to which I referred in section 0.1 of my general introduction. They effectively substitute for the originals in the worlds of

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51 Susanne M. I. Kaufmann, '100 Questions. 100 Answers. Stuttgart's Marcel Duchamp Collection and Serge Stauffer's Archive', *Duchamp, 100 Questions, 100 Answers* (Staatsgalerie Stuttgart/ Prestel, 2019), 12.

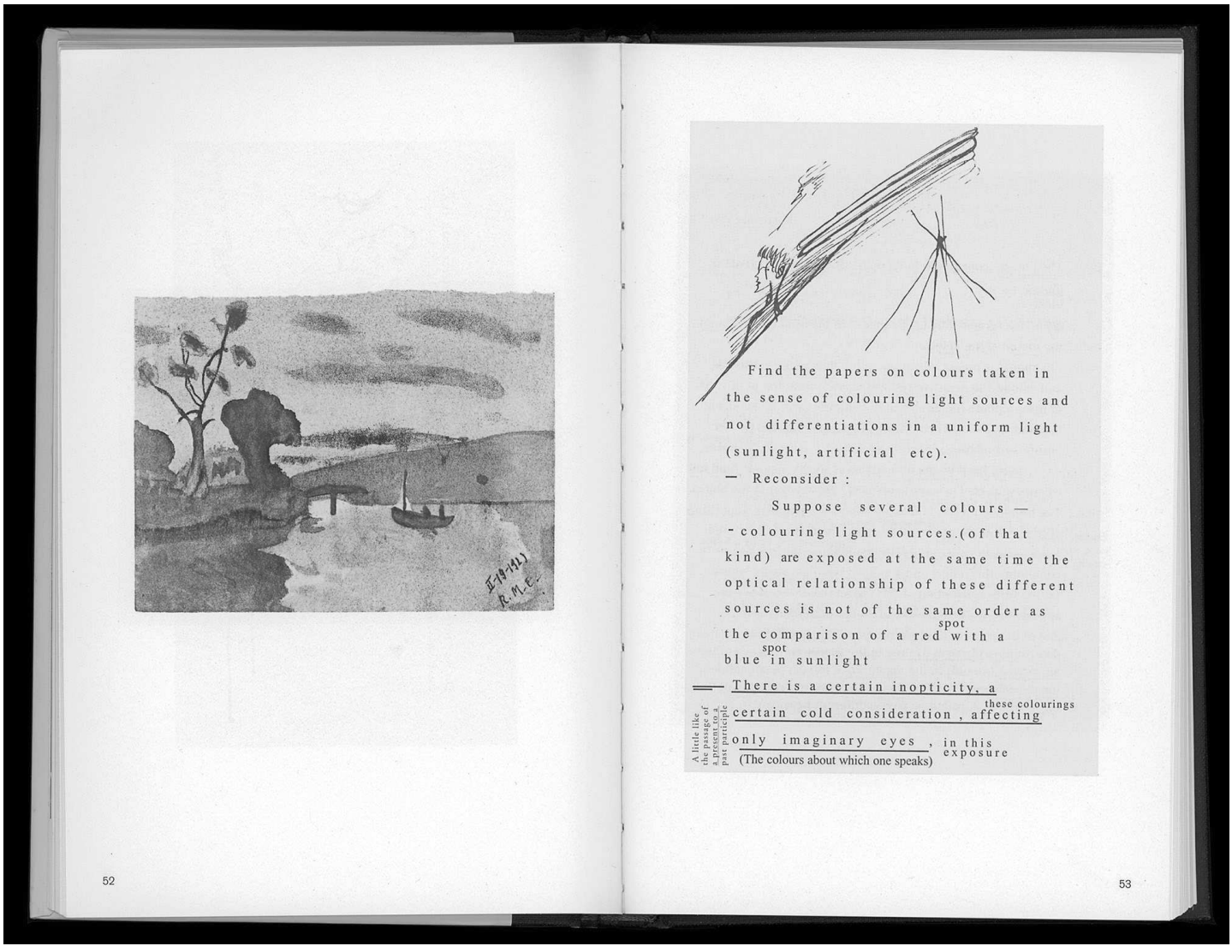
52 Kaufmann, *Duchamp, 100 Questions, 100 Answers*, 12.

53 "Der kleine typographische Versuch, den Sie mir senden, ist dem Original so nahe, wie ein gedruckter Texte es überhaupt je sein kann. Vieleicht könnten Sie wenn nötig die blaue Farbe für den blauen Farbstift hinfuzügen." Duchamp quoted in correspondence with Stauffer, 17 April 1958, in Serge Stauffer, *Marcel Duchamp, Die Schriften* (Regenbogen-Verlag, 1981), 254.

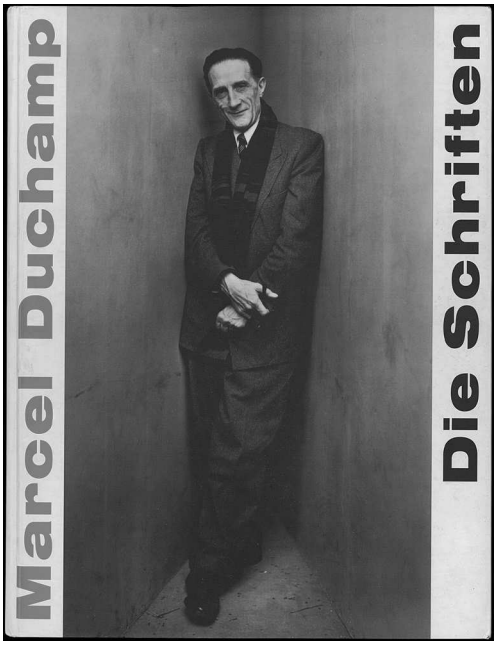


Retrouver les papiers sur les couleurs
prises dans le sens sources lumineuses
colorantes et non pas différenciations
dans une lumière uniforme (lumière
du soleil, artificielle etc).
— Tournez autour de :
Supposant plusieurs couleurs —
— sources lumineuses (de cet ordre)
exposées en même temps le rapport
optique [illegible] différentes sources
colorantes n'est plus de même ordre
que la comparaison d'un rouge à un
bleu dans une lumière solaire
— Il y a une certaine inopticité, une
certaine considération froide, ces colorants
que des yeux imaginaires dans cette exposition.
(Les couleurs dont on parle)

4.6.16. Marcel Duchamp, collotype note. Museum of Modern Art.



4.6.17. Duchamp, *à l'infinitif*, Richard Hamilton typotranslation, note 53.



4.6.18. Serge Stauffer, *Marcel Duchamp: Die Schriften*.

3

Einwand welches ist der Sinn ~~was ist~~ dieses

Wortes 4. Dimension , da es doch

keine taktile, oder sensorische

Entsprechung hat, wie ~~zum Bsp~~ sie

die 1. die 2., die 3. Dimension haben



Für eine 5. Dimension kann man sich hypthet.

vorstellen, dass das konstante Verhältnis,

welches jedes virtuelle Bild im 4-dimensionalen

Kontinuum determiniert, ~~seine Eigenschaft~~

~~als Konstante verliert~~ aufhört, konstant

zu sein und ~~wird~~ ~~und~~ deswegen indessen

nicht aufhört, Verhältnis zu sein .

Erklären .

---

ebenso für das 4-dimensionale Kontinuum : ~~Es~~

Poincarés Erklärung ~~durch~~ der n-dimensionalen Kontinua

durch den Schnitt, ~~den~~ der Kontinua von n−1 Dimensionen

versagt nicht. Sie wird im Gegenteil bestätigt

4.6.19. Duchamp, Serge Stauffer typotranslation.

English and German language Duchamp scholarship. Their differences are telling, however. Stauffer's typographic choices are inherently *reasonable* and pragmatic. They are systematic rationalisations of Duchamp's originals, careful not to enter the fractal and pedantic world of micro-interpretation. They superficially look most like the originals. In contrast, Hamilton considered the "integrated whole" — the graphic unity of word and image — the defining proposition of the notes. Pairing scans with type was completely unacceptable to him. By rendering Duchamp's text in an intricate typographic scheme, and by subjecting his every drawn mark to *unreasonably* interpretive encoding in digital line, Hamilton produced the definitive contribution to Duchamp Kremlinology: a work so cryptic, absurd, and excessively rigorous, that it is totally isomorphic with the original.

4.7 – Chunk

In the monograph *herbert bayer: visual communication architecture painting* (Bayer's preferred lowercase orthography preserved), in an essay titled 'on typography', there appear a hundred words or so, describing a typographic device called "square span". Bayer writes there:

> "tradition requires that sentences follow each other in a horizontal continuous sequence. paragraphs are used to ease perception by a slight break. there is no reason for this to be the only method to transmit language to the eye. sentences could as well follow each other vertically or otherwise, if it would facilitate reading. following is an excerpt of a letter from 'the reporter of direct mail advertising': 'square span' is putting words into thought groups of two or three short lines, such as

''after a	you will	in easily	groups of
short time	begin thinking	understood	words
you will	confusing	with	and
automatically	your	complicated	unnecessary
stop	sentences	phrases	words''*

> typewriters and typesetting machines would have to be adjusted to this method. text written in logical, short thought groups lends itself best. the advantages of grouping words support the theory that we do not read individual letters, but words or phrases. this poses a new challenge for the typographer."[54]

Bayer was a notable figure in European modernism. He studied and taught at the Bauhaus, later emigrated to the USA, and enjoyed success as an exhibition designer, graphic designer, and abstract painter. The square span proposition seems perfectly to align with his radical orthographic sensibilities — Bayer wanted to do away with uppercase letters entirely, and full stops at the ends of paragraphs. Yet, at the bottom of the column, a note in small type, marked by an asterisk, reads: "square span writing was developed by robert b. andrews, dallas, texas."

Andrews, it transpires, was a man with considerably fewer credentials as a typographic modernist. His obituary in the *Washington Post* of April 27, 2008, describes a twenty-year-old Southern Methodist University student who, in 1948, had written a term paper for his English class criticising the Gutenbergian tradition of rows of long, slender lines of type:

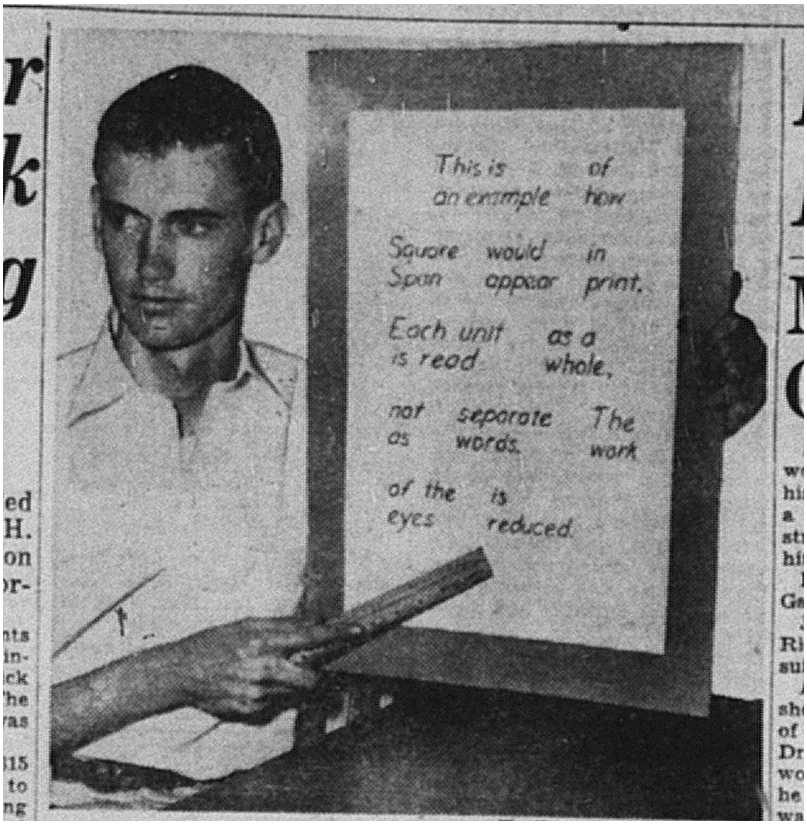
> "Andrews contended that is an unnatural format because it forces a reader's eyes to ignore the tendency to see words above or below the single line. Clustering words, he insisted, would increase reading speed, reduce eyestrain and mimic the phasing of a reader's voice."[55]

A clipping from another newspaper illustrates the obituary. The front page of the *Dallas Daily Times Herald* of Monday, July 11, 1949 shows an earnest-looking Andrews, his left arm around a large, mounted print displaying square-span writing. His right arm points towards a cluster of words with a ruler. The text reads:

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54 Herbert Bayer, 'on typography', *herbert bayer: visual communication architecture painting* (Studio Vista, 1967). Given that all of the discussion of these ideas referred to in this section were published in a US context, it's worth noting that while Bayer was born in Austria and both studied and taught at the Bauhaus in Germany, he became an American citizen in 1944.

55 Joe Holley, 'Devoted to Perfecting a Better Way to Read', *Washington Post* (Sunday April 27, 2008). The word "phasing" is transcribed here correctly, but the intention may have been "phrasing". In two of the experimental psychology papers cited below, the term 'phrasing' is used in relation to the dividing of sentences into meaningful parts.



Andrews's term paper had attracted some interest, and, with the assistance of one of his SMU professors, it was eventually syndicated to *Reader's Digest*, where it was published to a national audience.[56] This seems to have set Andrews's ideas on a trajectory decisively outside the canon of twentieth-century typographic discourse. His work was cited in a series of papers on matters of reading efficiency and comprehension in *The Journal of Applied Psychology* during the 1950s, 1960s, and 1970s, but the single mention of it that I can find in a graphic design context, other than in Bayer's essay, appears in *The Visible Word*, a survey of experimental and unorthodox typographic work edited by Herbert Spencer and published in London in 1969.[57]

Naturally, of most interest to the field of psychology was Andrews's claim that square span would increase the speed at which printed text could be comprehended. Separate studies by Alvin J. North and L. B. Jenkins, E. W. Dolch, George R. Klare and associates, and Ronald P. Carver comparatively

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56 *Reader's Digest* was reportedly the best-selling consumer magazine in the United States for much of the twentieth century. All of the citations given below that show consideration of Andrews's work in psychological literature actually refer to another syndication of the piece in *Texas Outlook*, published by the Texas State Teachers Association.

57 Herbert Spencer, *The Visible Word* (Lund Humphries in association with the Royal College of Art, 1968).

tested — by various means — the performance of square span against conventional linear typography and a "control" typography named "spaced unit".[58] This latter was devised by North and Jenkins to establish whether any differences in reading economy and comprehension they observed between square span and conventional typography were the result only of the division of sentences into "thought groups", or whether the specific spatial arrangement of words stacked onto multiple lines to be read in the same optical "fixation" that square span proposed was the decisive factor. Spaced unit typography follows the same logic of thought groups, but retains the single linear reading vector of conventional orthography. Essentially it is the addition of an unprinted space, around the width of four lowercase letters, between each thought group on a line.[59]

Each of these experimental studies confronted the essential problem of objectively measuring typographic economy. Klare et al. wrote: "The potential advantage that might be provided by thought units is little known, of course, because relatively little is known about how best to set them up."[60] The verb "chunking" was used in the title of Ronald P. Carver's 'Effect of A "Chunked" Typography on Reading Rate and Comprehension', and other authors use this terminology, albeit in general discussion of information theory with no specific consideration of typography.[61] It is notable that the most complete attempt at defining a chunk, or a "thought group" appeared contemporaneously with, and probably even before, Andrews's original text was syndicated in 1949. 'Phrase Perception in Reading' by E. W. Dolch, published in February 1949, sets out the constitution of a sentence:

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58 E. W. Dolch, 'Phrase Perception in Reading', *The Elementary School Journal* (1949); Alvin J. North and L. B. Jenkins, 'Reading Speed and Comprehension as a Function of Typography', *Journal of Applied Psychology* (1951); George R. Klare, William H. Nichols, and Emir H. Shufford, 'The Relationship of Typographic Arrangement to the Learning of Technical Training Material', *Journal of Applied Psychology* (1957). All of these experiments employed devices for measuring and plotting eye movements of their subjects, and drew on existing theory in this field: such as the work of French ophthalmologist Louis Émile Javal, whose 'Essay on the Physiology of Writing' was published in English translation in 1894.

59 North and Jenkins, 'Reading Speed and Comprehension'. Arguably, spaced unit typography could be considered even worse for comprehension than conventional orthography, by Andrews's reasoning. In the example sentences presented in spaced unit typography by Klare et al., the words "through the cooling system" are spatially more proximate to the opening clause of the sentence "The remaining 30% to 40%" than to the central clause which they are intended to follow "must be dissipated". Reading this arrangement with the kind of overall combined vertical and horizontal relation of lines that Andrews describes would lead the reader to confuse the order of the clauses in this sentence.

60 Klare et al., 'The Relationship of Typographic Arrangement'.

61 For an example of the latter: George A. Miller 'The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information', *Psychological Review* (1956).

> "We cannot put just any two or three words together and call them a phrase in the meaningful sense of the word. How shall we determine what words to combine into phrases? Perception is perception of meaning. Any combination of words perceived as a meaningful unit must have a meaningful unity."[62]

Dolch establishes a typology of sentences, with four initial categories of complexity. He argues that, through analysis, sentences of each type will tend to "fall apart" into predictable numbers of "subordinate thought-units". In the service of demonstrating these analyses, and despite his paper making no reference to typography, or to the work of Andrews (which probably had not been widely seen at the time of publication), and its predating all of the other papers mentioned here, Dolch presents example text in arrangements identical with both square span and spaced unit typographies.

He summarises his methodological reasoning thus:

> "This breakdown, of course, does not exhaust the possibilities of the phrase division of the sentence but merely emphasises the principle that, as the idea content of the sentence increases, the ideas fall apart into meaningful units of two or three words."[63]

This estimate of "two or three words" brings the discussion back to Bayer and his lament at the impracticality of square span being absorbed into the industrial practice of typography in 1959. The studies cited here were inconclusive on the subject of whether either the principle of thought groups, or the details of their spatial presentation in typography had any significant, measurable effect on readers. Either no difference was observed, or minor differences, but nothing sufficiently paradigmatic to alter the course of Gutenbergian orthodoxy and its relentless commodification in the printing and publishing industries.[64] Indeed Bayer's single sentence "typewriters and typesetting machines would have to be adjusted to this method" is a drastic understatement of the difficulties

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62 E. W. Dolch, 'Phrase Perception in Reading', *The Elementary School Journal* no. 49, vol. 6 (1949).

63 Dolch, 'Phrase Perception in Reading'.

64 Arguably, the efficacy of testing novel typographic arrangements in relation to deeply ingrained habits of reading is in itself flawed. Only Klare et al. address this doubt explicitly in their methodology: "It seems reasonable that square span might provide an advantage because it adds a vertical dimension to the restricted horizontal span developed in reading, but when the situation is novel (as with a tachistoscope). In the normal reading situation, the strongly developed habit of ignoring the lines of print above and below that being read cannot easily be broken, and therefore square span is at a disadvantage ..."

widespread adoption of square span as a general typographic scheme for mainstream, high volume reading material would have presented. In the mid-twentieth century — still an era in which letterpress was the norm in high volume printing — Andrews's proposition, and the minor flurry of research that it stimulated, were untimely and destined for obscurity.

In the past five decades, however, this technical inertia has been exploded, and the culture and tools of desktop publishing (DTP) have provided the conditions for alternatives to linear typography to thrive, as exemplified in 4.6, above.[65]

Between 2013 and 2017, I typeset a 70,000 word anthology of writings by curator Gavin Wade in square span (FIG. 4.7.3, 4.7.4). The parameters of square span, as I understood them then, were contained in a cropped scan that I had made of the section of text on the subject in the Bayer monograph many years previously, with the intention of finding, at some point, a project within which it might be appropriate to experiment with the form. My scan happened to omit the note which credits the idea to Andrews, and for this reason, my working method was strictly confined to the detail encoded into this single sentence from Bayer's essay: "'square span' is putting words into thought groups of two or three short lines", and the accompanying visual example Bayer provides.[66]

The choice to set Wade's writing this way was reasoned as follows. Wade had previously undertaken two substantial remakes of exhibition display structures designed by Bayer, and had a personal collection of his graphic design work for the Container Corporation of America.[67] Importantly, Wade's writing was

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65 I shall not be going into any detail about the radically exploded typographies of the 1990s, for me best exemplified by the contents of the two surveys *Typography Now* and *Typography Now II: The Next Wave* that Rick Poynor compiled for Booth-Clibborn Editions. Poynor included iconic work by designers such as April Greiman, Neville Brody, and David Carson. While this work perfectly exemplified the idea of exploding the Gutenbergian grid, its overarching energy was more personal and subjective. This work was theorised, too, as having a subversive, disruptive approach to modernist ideas of rationalising the delivery of meaning through optimal typographic form. My argument is specifically concerned with the isomorphisms possible in the dynamic processes of inscribing and decoding specific meanings through typographic form. In that respect, when North and Jenkins write "In general, the typographical arrangement of material may provide cues for the appropriate organisation of the thought content", they perfectly summarise why these typographical experiments belong in this part of my argument.

66 To be clear, all of the material presented in this section — Andrews's invention of square span, its analysis in the literature of experimental psychology, and its attempted commodification by the Mudoc Corporation — were unknown to me when typesetting the book described in this section.

67 During the design process, I also made a looser application of square span for the book *A Play* (2016), with artist Uta Eisenreich (FIG. 4.7.5, 4.7.6, 4.7.8). There a prose poem, *Things on a table* by Gertrude Stein, was set, as we expressed it in the colophon, "in-and-out-of-square span". In this case the typographic arrangements were made to reinforce and occasionally subvert the rhyming pairs in the text.











4.7.3. Gavin Wade, *Upcycle This Book*, selected pages.



to be used is to be human

The worst thing that could happen to anyone would be to never have been used for anything or by anybody.

artists are used by art art is used by society art belongs to society

and art is a tool the artist can decide for what the curator can decide for what the receiver can decide for what

any of these conduits can protest as to how they are used

we are a plinth we are a space we are a sphere we are a system

art is part of our sphere

art is at the skin of the sphere

inside the sphere are things we know and don't need to think about

outside the sphere are things we don't know the skin of the sphere is art

art is part of the system!

art is experiment and happening voluntary and involuntary

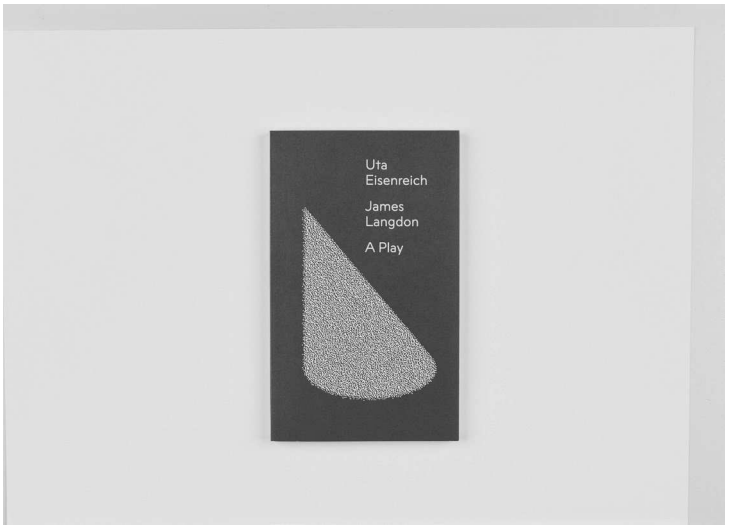
the unpredictable coming together of obvious elements to form an unanticipated whole

the function of the gallery is to prove that art does not need a home

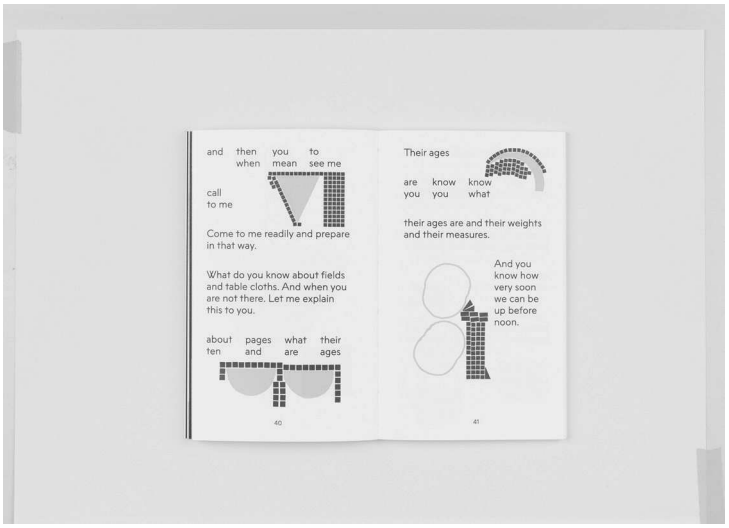
art does not need a home art is a home

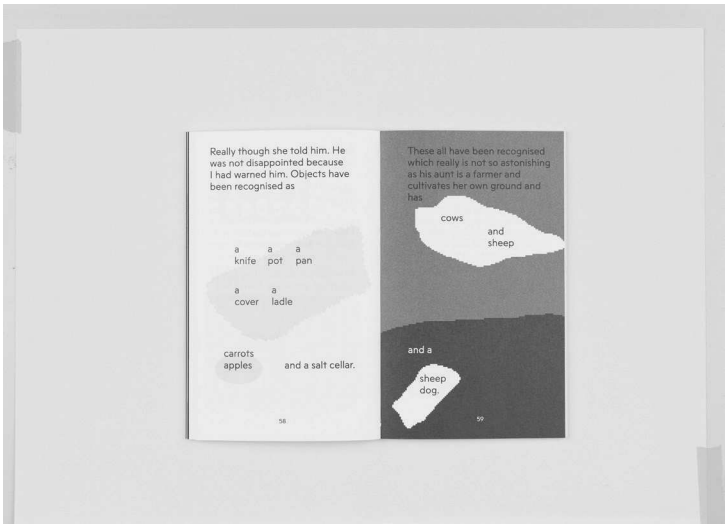
Performed at *State of the Arts*, an Arts Council England conference in London, in February 2011, at the invitation of curators Andy Field and Laura McDermott.

4.7.4. Gavin Wade, *Upcycle This Book*.







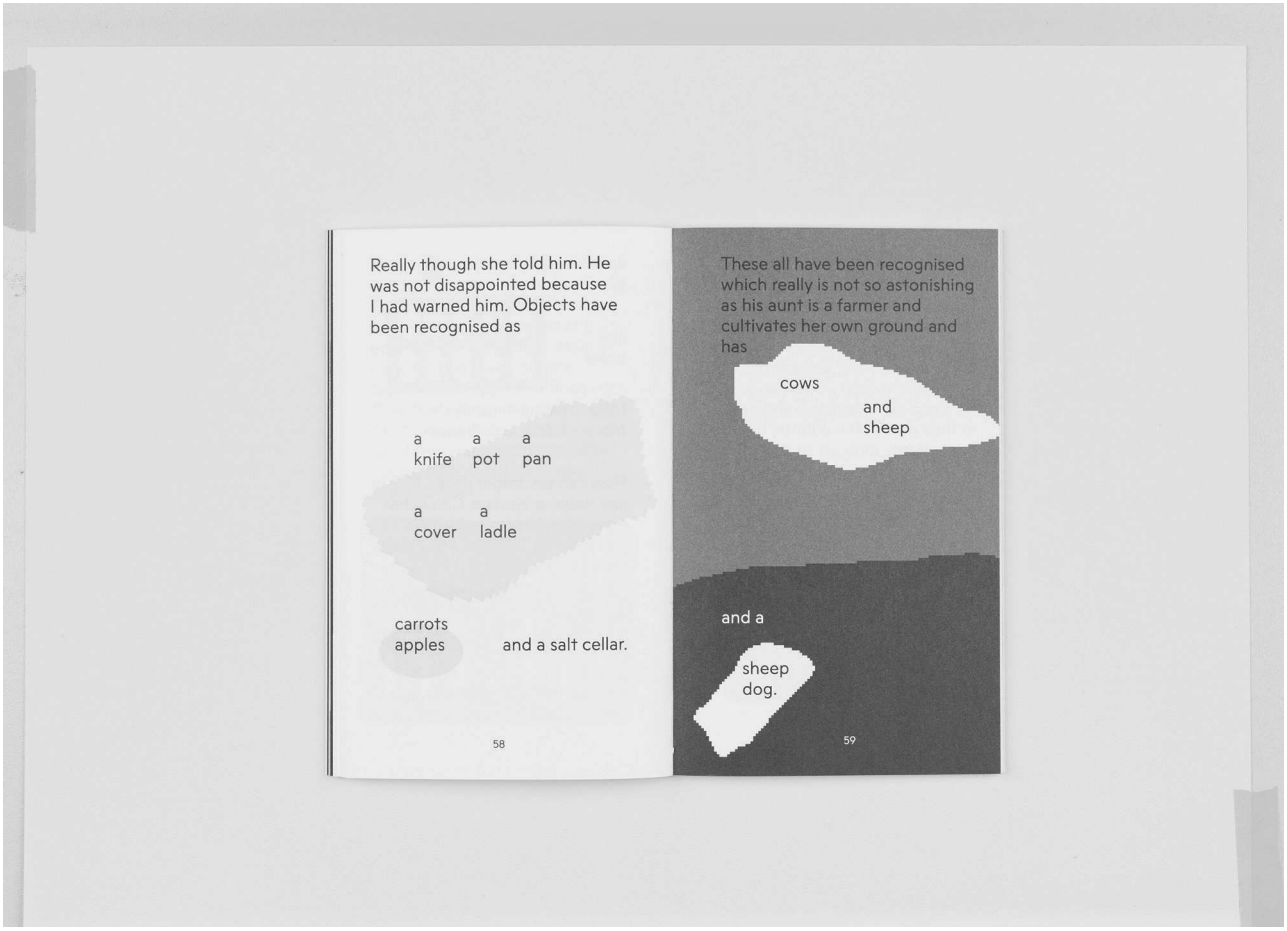




4.7.5. Uta Eisenreich and James Langdon, *A Play*, selected pages.



4.7.6. Uta Eisenreich and James Langdon, *A Play.*



4.7.7. Uta Eisenreich and James Langdon, *A Play.*

typically formulated in short, direct expressions, that seemed to accord with Bayer's qualification of square span: "text written in logical, short thought groups lends itself best".

The typesetting was done in Adobe InDesign. I approached the work systematically, but with the minimum of automation. Each "thought group" had its own text frame, which was set to Auto-Size by width only. I would import a couple of sentences, or a whole paragraph, from the manuscript into InDesign, and begin experimenting with arrangements of the words. In the Slug area of each page, duplicated from the document's Master Page, Bayer's formulation "thought groups of two or three short lines" was always visible and I referred to it continually. The precise content and composition of each thought group was decided according to three factors. First, Wade's manuscript already had some idiosyncratic typography that needed to be respected, particularly in the form of frequent forced line breaks interrupting series of short statements. To preserve the overall structure of the texts these could not be dissolved into the square span scheme. Second — and given the most relative importance in the decision-making — each thought group should "reinforce" the rhythm and meaning of the argument, as I interpreted it (and in dialogue with Wade, who reviewed the work regularly).[68] Third, if there were purely formal choices to be made between alternative compositions of a thought group that both satisfied the first two factors, these would be made in an effort to produce an overall page composition that would produce a pleasing ragged right edge, or to prevent related texts from being divided by the binding or a page turn.[69] As each thought group was resolved, a new text frame was drawn, word selections for the next thought group were experimented with, and the text frame ultimately positioned with consistent spaces to its surroundings. This last step was done by manually aligning the two text frames (taking advantage of the Auto-Sizing of the text frame widths, and the Snap to Object function), and then using a single strike of the right cursor key, with the required distance in millimetres having been specified in the Keyboard Increments preference pane. The number of horizontally-aligned series of thought groups that comprised a row was determined either simply by fitting, by observing an important break in the text, or by respecting one of the existing forced line breaks. Given that the amount of text occupying each page was considerably greater than the example given by

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68 "Reinforce" is used specifically in reference to Norman Potter's definition of isomorphism in his typography for *In:Quest of Icarus*, see section 0.1 of the general introduction.

69 The idea of ragging would seem anachronistic in relation to square span, but, in some cases, similar optical concerns did arise.

Bayer, I also decided to use thin lines between the rows of thought groups, to reinforce the idea that they are to be read horizontally and not vertically.

Despite the advent of DTP, there does not appear to have been a substantial revival of the kinds of elementary typographic critique that Andrews attempted. While such ambitions are conspicuously absent from mainstream typographic discourse — their rhetorics seeming too modernist, in a historical sense, perhaps — sustained attempts to advance these ideas do exist.

The Mudoc Corporation, "birthplace of interactive movable type" — "a new reading technology" — is actually one man: Wayne Reed Porter, a software engineer from Tempe, Arizona.[70] Where Robert Andrews conceived of "thought units", Herbert Bayer "thought groups", and Ronald Carver "chunked typography", Porter proposes "Muglyphs", which he defines as "logically-related groups of words arranged in clusters, each of which can be seen by a normally-sighted reader in a single fixation". The *mu* of Mudoc and Muglyph stands for "meaning unit".[71] The Mudoc Corporation exists to revive the overlooked potential of typographic word grouping for the new era of digital publishing. The corporation's business plan, published at the Mudoc website, sets out the scale of its ambition:

> "The Mu Primer trilogy will be the first books set in interactive movable type. We believe they have a good chance of becoming the largest, the second largest, and the third largest-selling titles of the 2nd decade of the 21st century (although we're not sure which will be which)."

This assessment appears to be based on the novel format of the books alone — their content exists presently only in outline. The trilogy comprises *The Mu Primer* itself, a textbook intended to familiarise the reader with the development

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70 Another example would be Friendly Type. Founded by David H. Knight, an associate of Andrews, Friendly Type publishes versions of existing books using typography that resembles Andrews's original formulation of square span. (It seems to have ceased operation sometime in 2019.)

71 The previous part of this section has not engaged in discussion of experimental psychological studies of the movements of the eye during reading, although these are frequently cited in the papers that I mention. I will not go into it further, other than to say that there is some alignment of the interchangeable concepts of "thought group", "chunked typography" and "meaning unit" with the idea of "fixations" of the eye as observed by French ophthalmologist Louis Émile Javal, whose 'Essay on the Physiology of Writing', was published in English translation in 1894. Porter's ideas are acknowledged by him as being derived from Andrews's work, amongst others. Chapter one of the 'The Mu Primer manuscript' deals with 'The Mu Typography'. The chapter cites Andrews's 1949 paper in *The Texas Outlook*, and a number of other sources, including the *American Journal of Psychology*.

of Mutypography, the various elements of the Mudoc software, and to introduce them to reading in these formats. *The Performance Evaulation Kit for the Mu Primer* is a form of literacy test, a supporting document to the first volume. Finally, *The Metafarm* is proposed as "a funny, exciting, mind-expanding and eminently filmable novel ... It is not science fiction. Rather, it's science extension that extrapolates, in a fictional format, the kinds of changes in our economies and ecologies that are likely to come about if and when interactive movable type becomes a basic communications tool and hydrogen becomes our primary fuel."[72]

The project is put into historical context in another of the many PDF provocations available at the website (it is telling that these documents are all presented in linear typography with only occasional demonstrations of Mutypography):

> "Many historians consider movable metal type the last millennium's 'invention of the millennium.' Movable metal type was a hardware invention that made mass literacy and public education possible. A new kind of movable type, interactive movable type, may come to be viewed as this millennium's invention of the millennium. Interactive movable type is a software invention that will enable everyone to read and could enable every nation to move rapidly to full literacy at costs they can afford."[73]

Porter's rhetoric is all about access, legibility, and literacy from the reader's point of view. The terms "interactive" and "movable" confer typographic agency on the *reader*, through a software interface that enables a reader to specify various parameters of a text's typography, which can then be output either as pages for printing or as a 'Muvie' — an animated presentation in which Muglyphs appear on screen at a frequency controlled by the reader.[74]

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72 'New Titles from The MuPress', Mudoc Corporation PDF. Via: https://www.mudoc.com/newtitls.pdf.

73 'Interactive Movable Type: Invention of the Millennium?', Mudoc website (2019). Via: http://www.mudoc.com/invenofmill.htm.

74 The Muvie format is a similar premise to a genre of smart phone application called speed reading, such as ReadQuick. This application, for example, does offer the possibility to break the text arbitrarily into groups of up to five words, but these appear in a simple row, with their type size changing rapidly to fit the available space. The muglyph is more sophisticated in its presentation as a stack, conforming to the requirement of being visible to a single 'fixation' of the eye. Other apps, such as Grammarly, primarily a writing app, use artificial intelligence to analyse sentence syntax.

On his website, Porter offers two PDFs of a single sample text, one typeset in linear text, the other in Mutypography. The Mutypography uses Times New Roman on pages with six columns, and is presented with variable Muglyphs of 2-, 3-, and 4-lines. The Mutypography is compratively inefficient — in Porter's example, the linear typography fits 429 words per page, the Mutypography only 188 words.[75] The chunking of the sample text appears to follow sentence clauses strictly, which in certain instances results in a lack of flow in the reading.

Among the roughly 10,000 words of text across numerous documents at the Mudoc website there is minimal description of any programmatic methodology for automating the designation of meaning units in software. Only the following, from the corporation's 2014 Kickstarter campaign web page — the campaign was, regrettably, unsuccessful — explicitly mentions the two algorithms on which the technology is based:[76]

> "The Mudoc Corporation's interactive movable type software will employ two new algorithms. The first, the annotation algorithm, is a special kind of text compression algorithm. This algorithm combines, in a single encoded character string, text that has been set in six different typographical formats (the linear typography and five mu typographies) and stores that text in a special digital format, the mudoc digital format. Text stored in the mudoc digital format will require little or no more storage space than text stored as conventional text strings. The second algorithm, the formation algorithm, will enable the computer to read the text stored in the mudoc digital format and to display that text in any of its six typographical formats — or in any of five additional formats, the five muvie formats."[77]

Another PDF, 'Setting Interactive Movable Type', describes the role of the 'Musetter' — "the person setting the text, who will often be the author of the document" — in operating the Mudoc software. The Musetter inserts 'Mumarkers' into the text by pressing "one key designated as such on the

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75 It would seem that these Muglyphs have been manually, rather than algorithmically, chunked, as the Muglyph generator interface shown at the Mudoc website does not offer an option to specify variable line Muglyphs — linear, 1-line, 2-line, 3-line, 4-line, and 5-line are offered as separate options. 1-line Mutypography being essentially the same as North and Jenkins's "spaced-unit" typography — lines of linear prose with large breaks between each thought group (Muglyph).

76 The Kickstarter raised only $434 of a $950,000 goal.

77 'What the Mudoc Software Will Do for Readers', Mudoc Corporation PDF. Via: https://www.mudoc.com/muswdoes.pdf.

keyboard" after each group of words that they wish to identify as a Muglyph. At the conclusion of this process, the software then generates a further series of Muglyphs corresponding to the 2-, 3-, 4- and 5- line Muglyphs. After each series of Muglyphs is generated, the author must review the results before the software proceeds with the next step in the series.

Porter's proposed algorithm automates the work of typography, refiguring it as a direct interface between author and reader. In this respect, Mutypography *is* an isomorphic typography: it affords the *writer* the unmediated possibility to define the meaning units in a text. There remains, however, an essential tension in the idea of a typography that spatially relates — through chunks, thought groups, Muglyphs, or the more idiosyncratic formations of typotranslation — the content and meaning of a text to its presentation on the page. Such typographies might be spatially inefficient, but in digital publishing contexts that may not matter. The consolidation of linear typography in centuries of hardware, now remediated as software and workflow, creates and maintains a role for the typographer as the one who supports the reader in making the text conventionally accessible. Emil Ruder's 1967 statement "it is not the typographer's business to interpret literature in his own way", might be clarified in 2021 as the typographer *does not have time* to interpret literature in his own way. As demonstrated in Richard Hamilton's typotranslations of Duchamp, a typographic isomorph requires immense graphic labour. If communication design work, such as typesetting, becomes more automated, this may remove the role of the typographer as the interpreter, but may also potentially enable an isomorphic typography, in which the *author* defines — at least structurally — how the meaning of a text is typographically transmitted.

The chunk represents a historically rich alternative to the line, which, in its fidelity to syntax and sentence structure, appeals to a potentially more universally applicable kind of typographic isomorph. This history — largely outside mainstream typographic discourse — is defined by its being technically untimely. To implement the basic protocols of Mutypography in software is now relatively simple, but in a way that its inventor did not anticipate and is not equipped to capitalise on. Mutypography could enable the kind of effects that Hamilton achieves to be applied to general text, yet it is intended, by its protagonist, to signal a future in which the function of software might entirely preclude the role of the informed typographic intermediary. In this model, the author encodes the syntactical structure of the text and software makes it available for limited reformatting, according to the preferences of the reader. The isomorphic typographer is redundant.