Dissertation typesetting considerations

Tony Zorman

Abstract

How does one go about writing an easily readable — and pretty — PhD thesis, or a similar technical monograph? While this question seems intractable to answer in general, perhaps talking about the journey of typesetting my own dissertation will yield some inspiration for what is possible, and how to go about implementing one's ideas in LaTeX.

1 Introduction

First things first: Figure 1 shows a single two-page spread of how the end product looks like (coloured cross-references have been greyscaled for print). If you're curious, the entire thesis is available at [6], as well as at `tony-zorman.com/dissertation.pdf`. The source code can be found at [7]; this whole article started its life as a blog post [8], which also features a few more of those big two-page spreads.

1.1 The two most important rules of thesis typesetting

I don't want to bury the lede all that far down the article, so let me start with the two most important rules of thesis typesetting.

First, find out if your university, or its library, has any arcane rules regarding how your thesis has to look — double spacing, $42g/m^2$ paper, margins that must be 3.145cm *exactly*, ...; that kind of thing. Given these kinds of outside restrictions, it's often impossible to end up with something that's aesthetically pleasing. Luckily for me, there were basically no requirements that I had to satisfy, except that the document's size had to be A4. Check.

Second, start early and concentrate on actually getting it done! Even just streamlining and unifying notation takes more time than one thinks, especially if one also cares at least an epsilon about typography. What cuts down on the time needed is that LaTeX has been around for a long time, and most package manuals (that I've read) are quite high quality; chances are that someone else will probably have solved your super-specific problem already. Still, start early.

2 The document class

Getting started, the first thing one needs to decide upon is which document class to use. As far as I can tell, there are two relevant contenders here: `memoir` and `koma-script`, the latter featuring the `scrbook` class. In the end, `memoir` won solely because I found the manual more pleasant to read, and thus had an easier time customising things. Plus, it is much more extensive: both manuals clock in at around 600 pages, but for `koma-script` this is about the whole suite instead of just one document class! There are also a bunch of concrete and extensive examples in the `memoir` manual, which are easy to learn from.

I further had the feeling that `memoir` laid a more heavy emphasis on typographical considerations, but this might be because I didn't read the `koma-script` manual as closely. This choice did probably not matter all that much in the grand scheme of things, but I'm quite happy with `memoir` and would recommend it for any kind of book-length project.

3 Page layout

The default `a4paper` page layout that `memoir` has is *fine*, though the wider `\isopage` — inspired by page dimensions suggested by Robert Bringhurst in [1] — yields a nicer looking printout in my opinion. This is especially true with a slightly larger font size, which is more or less mandatory if you want to make a format as unwieldy as A4 look good.

Being a little bit wider, `\isopage` is also good for long-ish formulas and large-ish diagrams, both of which my thesis has more than enough of. Together with my chosen fonts, the final page layout results in a maximum of about 72 characters per line. This is on the higher side of what I would prefer, but either increasing the font size or decreasing the margins would impede too much on the actual content, so I settled for these values.

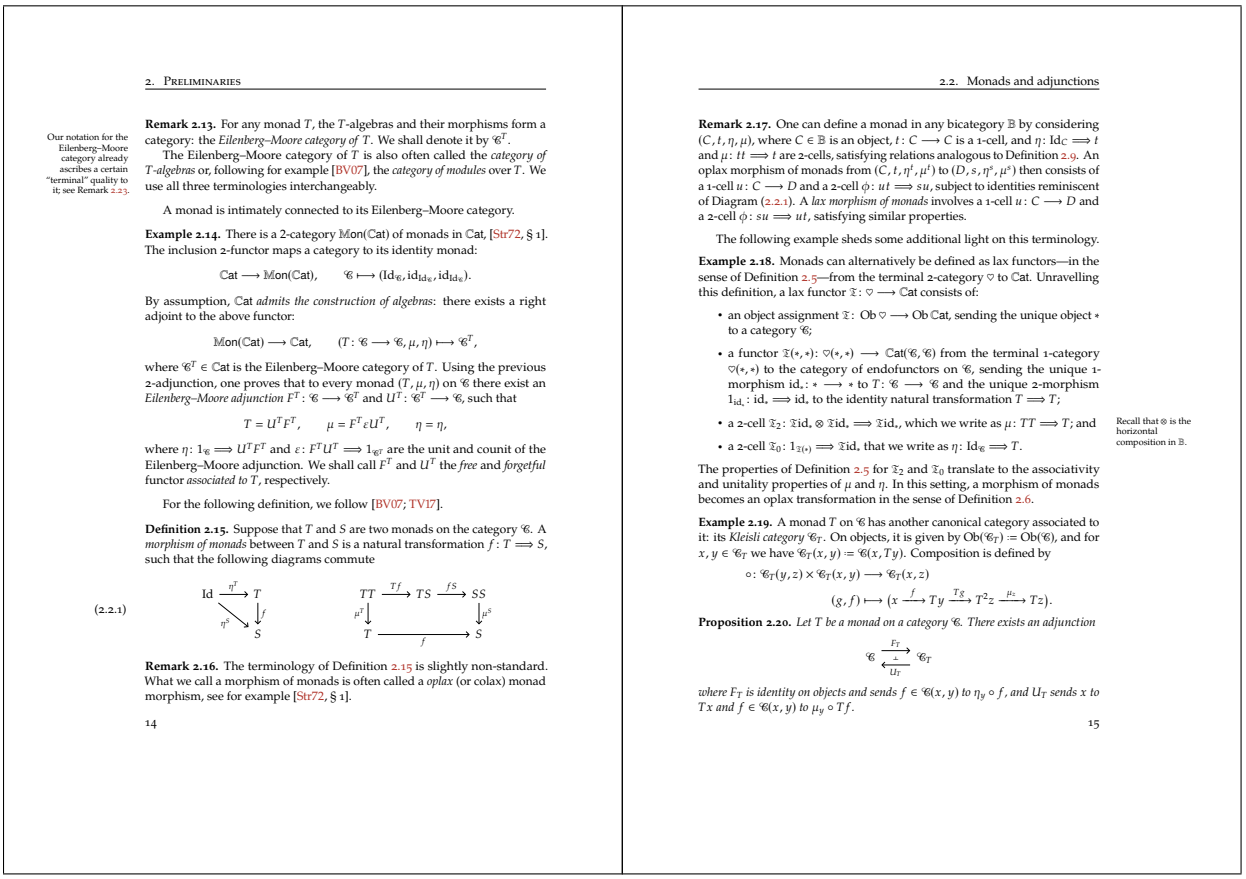
Sidenotes — much more on that later — are constrained to a maximum of around 21 characters via `\setmarginnotes{17pt}{80pt}{\onelineskip}`. This is quite narrow, though I still found it to work fairly well due to the less technical nature of sidenotes. It certainly helps me to not go overboard with them, which was not advisable given the context of a dissertation in mathematics; their mere existence probably stretches my novelty budget quite a bit.

3.1 Chapter headings

For chapter headings, `memoir` features a wide variety of different styles. I settled on the `bringhurst` chapter style quite quickly, if only out of my admiration for the book [1]. As illustrated by Figure 2, by default this does not, however, include the chapter number anywhere.

In contrast, Bringhurst's famous book puts a rather large number in the margin. Thankfully, this is not difficult to add to the `bringhurst` style — so much so that someone on TeX.StackExchange has already done it [3]. The exact `bringhurst.sty` file I used to get to Figure 3, which is a slightly modified version of the one in *idem*, is available at [7].

doi.org/10.47397/tb/46-3/tb144zorman-thesis



2. Preliminaries

Our notation for the Eilenberg–Moore category already ascribes a certain "terminal" quality to it; see Remark 2.23.

Remark 2.13. For any monad T, the T-algebras and their morphisms form a category: the *Eilenberg–Moore category of* T. We shall denote it by $\mathscr{C}^T$.

The Eilenberg–Moore category of T is also often called the *category of T-algebras* or, following for example [BV07], the *category of modules* over T. We use all three terminologies interchangeably.

A monad is intimately connected to its Eilenberg–Moore category.

Example 2.14. There is a 2-category $\mathbb{M}\mathrm{on}(\mathbb{C}\mathrm{at})$ of monads in $\mathbb{C}\mathrm{at}$, [Str72, § 1]. The inclusion 2-functor maps a category to its identity monad:

$$\mathbb{C}\mathrm{at} \longrightarrow \mathbb{M}\mathrm{on}(\mathbb{C}\mathrm{at}), \qquad \mathscr{C} \longmapsto (\mathrm{Id}_{\mathscr{C}}, \mathrm{id}_{\mathrm{Id}_{\mathscr{C}}}, \mathrm{id}_{\mathrm{Id}_{\mathscr{C}}}).$$

By assumption, $\mathbb{C}\mathrm{at}$ *admits the construction of algebras*: there exists a right adjoint to the above functor:

$$\mathbb{M}\mathrm{on}(\mathbb{C}\mathrm{at}) \longrightarrow \mathbb{C}\mathrm{at}, \qquad (T : \mathscr{C} \longrightarrow \mathscr{C}, \mu, \eta) \longmapsto \mathscr{C}^T,$$

where $\mathscr{C}^T \in \mathbb{C}\mathrm{at}$ is the Eilenberg–Moore category of T. Using the previous 2-adjunction, one proves that to every monad (T, μ, η) on $\mathscr{C}$ there exist an *Eilenberg–Moore adjunction* $F^T : \mathscr{C} \longrightarrow \mathscr{C}^T$ and $U^T : \mathscr{C}^T \longrightarrow \mathscr{C}$, such that

$$T = U^T F^T, \qquad \mu = F^T \varepsilon U^T, \qquad \eta = \eta,$$

where $\eta : 1_{\mathscr{C}} \Longrightarrow U^T F^T$ and $\varepsilon : F^T U^T \Longrightarrow 1_{\mathscr{C}^T}$ are the unit and counit of the Eilenberg–Moore adjunction. We shall call F^T and U^T the *free* and *forgetful* functor *associated to* T, respectively.

For the following definition, we follow [BV07; TV17].

Definition 2.15. Suppose that T and S are two monads on the category $\mathscr{C}$. A *morphism of monads* between T and S is a natural transformation $f : T \Longrightarrow S$, such that the following diagrams commute

(2.2.1)

$$\begin{array}{ccc} \mathrm{Id} & \xrightarrow{\eta^T} & T \\ & \searrow^{\eta^S} & \downarrow f \\ & & S \end{array} \qquad\qquad \begin{array}{ccccc} TT & \xrightarrow{Tf} & TS & \xrightarrow{fS} & SS \\ {\scriptstyle \mu^T}\downarrow & & & & \downarrow{\scriptstyle \mu^S} \\ T & & \xrightarrow[f]{} & & S \end{array}$$

Remark 2.16. The terminology of Definition 2.15 is slightly non-standard. What we call a morphism of monads is often called a *oplax* (or colax) monad morphism, see for example [Str72, § 1].

14

2.2. Monads and adjunctions

Remark 2.17. One can define a monad in any bicategory $\mathbb{B}$ by considering (C, t, η, μ), where $C \in \mathbb{B}$ is an object, $t : C \longrightarrow C$ is a 1-cell, and $\eta : \mathrm{Id}_C \Longrightarrow t$ and $\mu : tt \Longrightarrow t$ are 2-cells, satisfying relations analogous to Definition 2.9. An oplax morphism of monads from (C, t, η^t, μ^t) to (D, s, η^s, μ^s) then consists of a 1-cell $u : C \longrightarrow D$ and a 2-cell $\phi : ut \Longrightarrow su$, subject to identities reminiscent of Diagram (2.2.1). A *lax morphism of monads* involves a 1-cell $u : C \longrightarrow D$ and a 2-cell $\phi : su \Longrightarrow ut$, satisfying similar properties.

The following example sheds some additional light on this terminology.

Example 2.18. Monads can alternatively be defined as lax functors—in the sense of Definition 2.5—from the terminal 2-category $\heartsuit$ to $\mathbb{C}\mathrm{at}$. Unravelling this definition, a lax functor $\mathfrak{T} : \heartsuit \longrightarrow \mathbb{C}\mathrm{at}$ consists of:

- an object assignment $\mathfrak{T} : \mathrm{Ob}\,\heartsuit \longrightarrow \mathrm{Ob}\,\mathbb{C}\mathrm{at}$, sending the unique object $*$ to a category $\mathscr{C}$;
- a functor $\mathfrak{T}(*,*) : \heartsuit(*,*) \longrightarrow \mathbb{C}\mathrm{at}(\mathscr{C}, \mathscr{C})$ from the terminal 1-category $\heartsuit(*,*)$ to the category of endofunctors on $\mathscr{C}$, sending the unique 1-morphism $\mathrm{id}_* : * \longrightarrow *$ to $T : \mathscr{C} \longrightarrow \mathscr{C}$ and the unique 2-morphism $1_{\mathrm{id}_*} : \mathrm{id}_* \Longrightarrow \mathrm{id}_*$ to the identity natural transformation $T \Longrightarrow T$;
- a 2-cell $\mathfrak{T}_2 : \mathfrak{T}\mathrm{id}_* \otimes \mathfrak{T}\mathrm{id}_* \Longrightarrow \mathfrak{T}\mathrm{id}_*$, which we write as $\mu : TT \Longrightarrow T$; and
- a 2-cell $\mathfrak{T}_0 : 1_{\mathfrak{T}(*)} \Longrightarrow \mathfrak{T}\mathrm{id}$, that we write as $\eta : \mathrm{Id}_{\mathscr{C}} \Longrightarrow T$.

Recall that $\otimes$ is the horizontal composition in $\mathbb{B}$.

The properties of Definition 2.5 for $\mathfrak{T}_2$ and $\mathfrak{T}_0$ translate to the associativity and unitality properties of μ and η. In this setting, a morphism of monads becomes an oplax transformation in the sense of Definition 2.6.

Example 2.19. A monad T on $\mathscr{C}$ has another canonical category associated to it: its *Kleisli category* $\mathscr{C}_T$. On objects, it is given by $\mathrm{Ob}(\mathscr{C}_T) := \mathrm{Ob}(\mathscr{C})$, and for $x, y \in \mathscr{C}_T$ we have $\mathscr{C}_T(x, y) := \mathscr{C}(x, Ty)$. Composition is defined by

$$\circ : \mathscr{C}_T(y, z) \times \mathscr{C}_T(x, y) \longrightarrow \mathscr{C}_T(x, z)$$
$$(g, f) \longmapsto (x \xrightarrow{f} Ty \xrightarrow{Tg} T^2 z \xrightarrow{\mu_z} Tz).$$

Proposition 2.20. *Let T be a monad on a category $\mathscr{C}$. There exists an adjunction*

$$\mathscr{C} \underset{U_T}{\overset{F_T}{\rightleftarrows}} \mathscr{C}_T$$

where F_T is identity on objects and sends $f \in \mathscr{C}(x, y)$ to $\eta_y \circ f$, and U_T sends x to Tx and $f \in \mathscr{C}(x, y)$ to $\mu_y \circ Tf$.

15

Figure 1: A two-page spread of the thesis.

The struggle itself toward the heights is enough to fill a man's heart. One must imagine Sisyphus happy.

Albert Camus; The Myth of Sisyphus

DUOIDAL R-MATRICES

Duoidal categories were introduced in [AM10] under the name 2-*monoidal categories*, in order to study bilax monoidal functors and various constructions on linear species. They generalise both braided monoidal categories, by considering two monoidal structures that are connected by a non-invertible interchange law, as well as the 2-fold monoidal categories of [BFSV03] where the two tensor products are assumed to share a unit. Duoidal categories have since been used to study higher-dimensional Hopf theory [BCZ13; BS13; AHLF18; LFV20; Böh21], and have also found applications in various other fields of mathematics, [GLF16; SS22; Rom24; Tor24].

Figure 2: Memoir's default `bringhurst` chapter style.

I am big! It's the pictures that got small.

Norma Desmond; Sunset Boulevard

HOPF TRIMODULES

9

Theorems 8.48 to 8.50 give general reconstruction results in the non-rigid setting, which has recently seen increased interest in multiple areas, see for example [DSPS19; ALSW21] or [Str24b, Corollary 10.11]. However, lax $\mathscr{C}$-module monads on $\mathscr{C}$ are less accessible than mere algebra objects of $\mathscr{C}$, and may indeed appear not very accessible in general. To show that this need not be the case, we again turn to the Hopf-algebraic setting.

Recall that a ring category—the non-rigid counterpart of a tensor category, see [EGNO15, Sections 4.2 and 5.4]—which admits a fibre functor to vect is monoidally equivalent to the category of finite-dimensional left B-comodules

Figure 3: Custom `bringhurst` chapter style.

3.2 The margin

A quick confession upfront: I have an almost unhealthy addiction to sidenotes.[1] This is about where one hits their first major bump, in that `memoir` and the `sidenotes` package are incompatible. For example, both define a `\sidecaption` command, and both import the `changepage` package, although with different options. The lawful-good way would be to try and find a good patch to send upstream, but this seems quite infeasible in this case; at least to me. The easy way out is to include the `sidenotes` dependency as a local package and remove the offending commands — they are unused in my particular case.

Thankfully, LaTeX's error messages are comprehensible for once, so patching the `sidenotes` package is straightforward. The finished product is again available at [7].

With those changes in place, the `\sidenote` command works as expected; I wrote a small wrapper that additionally sets sidenotes ragged left or right, depending on the parity of the page.

[1] He said, writing in a two-column layout without the chance to add any!

The conditions for the multiplication and unit of a comodule monad C on $\mathscr{M}$ over a bimonad B on $\mathscr{C}$ to be morphisms of comodule functors is given in Figure 5.4. Notice how the conditions are analogous to Figure 5.2.

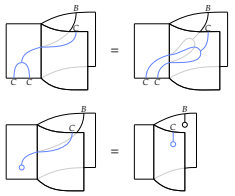


Figure 5.4: Conditions for the multiplication and unit of a comodule monad to be morphisms of comodule functors.

Figure 4: Figure captions are pushed into the margin.

```
\renewcommand{\note}[1]{\sidenote{%
  \scriptsize
  \checkoddpage
  \ifoddpage\raggedright\else\raggedleft\fi
  {#1}}}
```

Further, I don't actually use the `\sidecaption` implementation of either `memoir` or `sidenotes`, but chose to roll my own. The mandatory argument contains the label text and the label itself; the optional argument moves the label text around.

```
\renewcommand{\scaption}[2][0cm]{%
  \marginnote{\vspace{#1}\caption{%
    \checkoddpage
    \ifoddpage\raggedright\else\raggedleft\fi
    {#2}}}}
```

This is probably less code than what it would take to customise `memoir`'s `\sidecaption` to do what I want, and I get more control over the typesetting on top of that. The price one pays is that the usage of `\scaption` is a tad unintuitive, in that the `\label` of the figure has to go inside of the caption:

```
\begin{figure}[htbp]
  \centering
  \tikzfig{the-figure}
  \scaption[3cm]{The caption.%
    \label{fig:the-label}}
\end{figure}
```

However, I think the end result, as seen in Figure 4, looks quite nice. The `caption` package was used to set the *Figure x.y* part a little bit larger than the rest, to make it "pop" a bit more:

```
\usepackage{caption}
\captionsetup{style=base,
  labelfont=footnotesize,
  textfont=scriptsize}
```

Another thing I did was push equation numbers from their usual place at the right edge of the text area into the margin. This means that equation numbers are sometimes on the left of the page, depending on where the margin is. This is useful for larger diagrams or longer formulas, which nevertheless still have to have an equation number; now they neither need to intrude upon the margin nor be scaled quite so aggressively; see Figure 5.

The code for this is a bit more involved; I ended up using a variant of [2] to achieve it, which will — for brevity — be omitted here, but can readily be found in the source code repository.

4 Picking fonts

For the default calligraphic font, I settled upon `boondoxupr` from the `mathalfa` package. For reasons of space, let us only look at the first few (uppercase) letters of the alphabet. The default Computer Modern alphabet looks like $\mathcal{ABCDEF}$, whereas here is `boondoxupr`: $\mathscr{ABCDEF}$. Much fancier, though not to the point of unreadability, which can be a problem with these more exotic fonts. I also went ahead and chose `esstix` as a Fraktur font, for slightly less bold letters: $\mathfrak{ABCDEF}$.

Moving on, much more important than a good calligraphic or Fraktur font is a good text font — it is, after all, what one is looking at almost all of the time. For me, there are two top contenders here: Libertinus, provided by a package of the same name on CTAN, on the one hand

The quick brown fox jumps over the lazy dog.

and Palatino — or rather a clone of it, in the form of the `newpx` package — on the other:

The quick brown fox jumps over the lazy dog.

Libertinus has one critical flaw, which is that the letter "f" in its italics variant extends way too far to the right. This clashes quite significantly with `boondoxupr`, as well as some other letters that lean a bit more to the left:

A feature of $\mathscr{C}$.

This issue only gets exacerbated once something like `microtype` comes into play and tries to squeeze one more equation onto a line. Palatino, while not perfect, fares a bit better here:

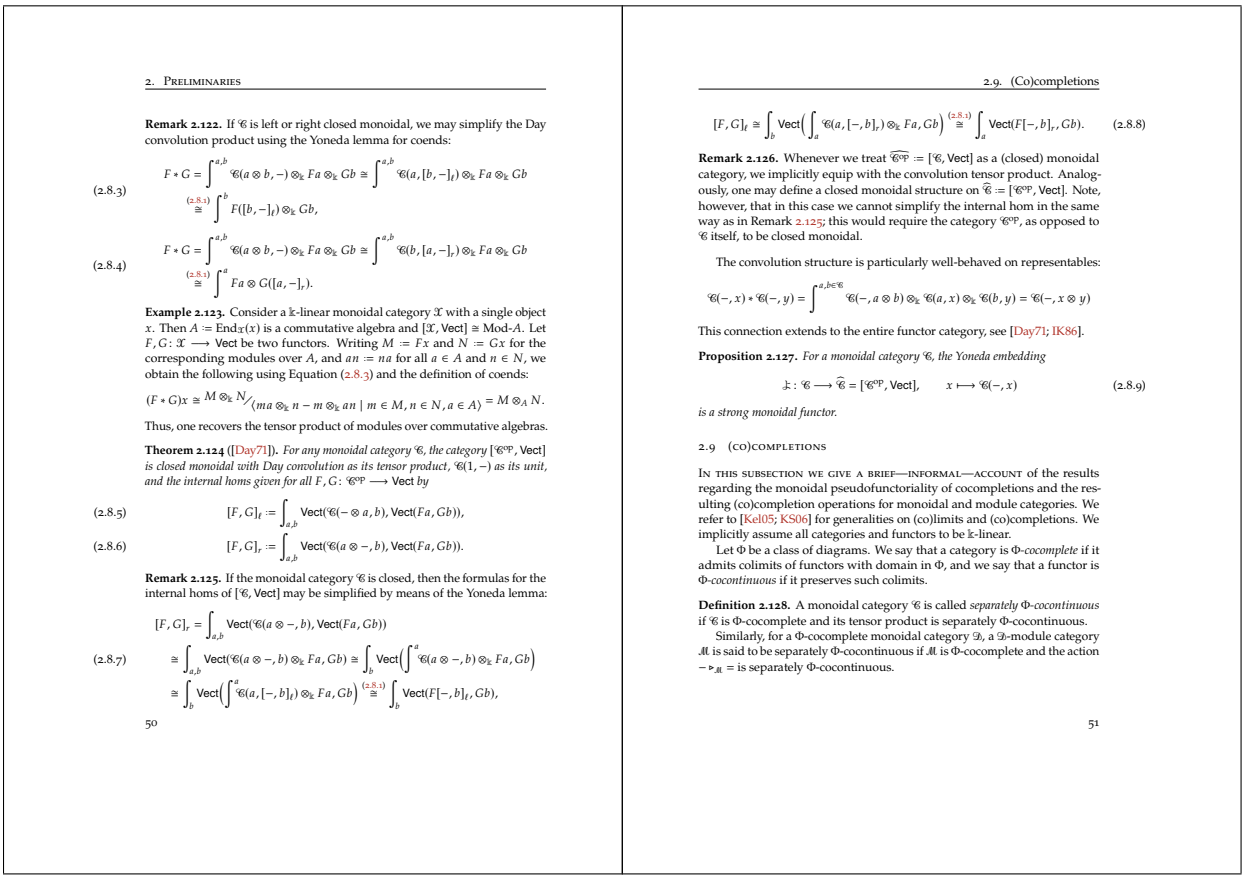
A feature of $\mathscr{C}$.

As I didn't want to manually check every occurrence of "f" at the end of a word and potentially add a thin space after it, the choice was forced upon me. There are some ways to manually adjust the spacing of individual letters, see for example [5] for some ideas, but I didn't explore this direction further.

4.1 `mathtools` enters the picture

Then, while preparing this very document, I found out about the `mathic` option of the `mathtools` package, which applies some italic corrections to the `\(\)` inline maths environment. Using that, the above comparison becomes

A feature of $\mathscr{C}$. (Libertinus)
A feature of $\mathscr{C}$. (Palatino)



2. Preliminaries

Remark 2.122. If $\mathscr{C}$ is left or right closed monoidal, we may simplify the Day convolution product using the Yoneda lemma for coends:

$$F * G = \int^{a,b} \mathscr{C}(a \otimes b, -) \otimes_{\Bbbk} Fa \otimes_{\Bbbk} Gb \cong \int^{a,b} \mathscr{C}(a, [b,-]_\ell) \otimes_{\Bbbk} Fa \otimes_{\Bbbk} Gb \overset{(2.8.1)}{\cong} \int^{b} F([b,-]_\ell) \otimes_{\Bbbk} Gb, \tag{2.8.3}$$

$$F * G = \int^{a,b} \mathscr{C}(a \otimes b, -) \otimes_{\Bbbk} Fa \otimes_{\Bbbk} Gb \cong \int^{a,b} \mathscr{C}(b, [a,-]_r) \otimes_{\Bbbk} Fa \otimes_{\Bbbk} Gb \overset{(2.8.1)}{\cong} \int^{a} Fa \otimes G([a,-]_r). \tag{2.8.4}$$

Example 2.123. Consider a $\Bbbk$-linear monoidal category $\mathscr{X}$ with a single object x. Then $A \coloneqq \mathrm{End}_{\mathscr{X}}(x)$ is a commutative algebra and $[\mathscr{X}, \mathsf{Vect}] \cong \text{Mod-}A$. Let $F, G \colon \mathscr{X} \longrightarrow \mathsf{Vect}$ be two functors. Writing $M \coloneqq Fx$ and $N \coloneqq Gx$ for the corresponding modules over A, and $an \coloneqq na$ for all $a \in A$ and $n \in N$, we obtain the following using Equation (2.8.3) and the definition of coends:

$$(F * G)x \cong M \otimes_{\Bbbk} N \big/ \langle ma \otimes_{\Bbbk} n - m \otimes_{\Bbbk} an \mid m \in M, n \in N, a \in A \rangle = M \otimes_A N.$$

Thus, one recovers the tensor product of modules over commutative algebras.

Theorem 2.124 ([Day71])**.** *For any monoidal category $\mathscr{C}$, the category $[\mathscr{C}^{\mathrm{op}}, \mathsf{Vect}]$ is closed monoidal with Day convolution as its tensor product, $\mathscr{C}(1, -)$ as its unit, and the internal homs given for all $F, G \colon \mathscr{C}^{\mathrm{op}} \longrightarrow \mathsf{Vect}$ by*

$$[F, G]_\ell \coloneqq \int_{a,b} \mathsf{Vect}(\mathscr{C}(- \otimes a, b), \mathsf{Vect}(Fa, Gb)), \tag{2.8.5}$$

$$[F, G]_r \coloneqq \int_{a,b} \mathsf{Vect}(\mathscr{C}(a \otimes -, b), \mathsf{Vect}(Fa, Gb)). \tag{2.8.6}$$

Remark 2.125. If the monoidal category $\mathscr{C}$ is closed, then the formulas for the internal homs of $[\mathscr{C}, \mathsf{Vect}]$ may be simplified by means of the Yoneda lemma:

$$\begin{aligned}[F, G]_r &= \int_{a,b} \mathsf{Vect}(\mathscr{C}(a \otimes -, b), \mathsf{Vect}(Fa, Gb)) \\ &\cong \int_{a,b} \mathsf{Vect}(\mathscr{C}(a \otimes -, b) \otimes_{\Bbbk} Fa, Gb) \cong \int_b \mathsf{Vect}\Big(\int^a \mathscr{C}(a \otimes -, b) \otimes_{\Bbbk} Fa, Gb\Big) \\ &\cong \int_b \mathsf{Vect}\Big(\int^a \mathscr{C}(a, [-, b]_\ell) \otimes_{\Bbbk} Fa, Gb\Big) \overset{(2.8.1)}{\cong} \int_b \mathsf{Vect}(F[-, b]_\ell, Gb),\end{aligned} \tag{2.8.7}$$

50

2.9. (Co)completions

$$[F, G]_\ell \cong \int_b \mathsf{Vect}\Big(\int_a \mathscr{C}(a, [-, b]_r) \otimes_{\Bbbk} Fa, Gb\Big) \overset{(2.8.1)}{\cong} \int_a \mathsf{Vect}(F[-, b]_r, Gb). \tag{2.8.8}$$

Remark 2.126. Whenever we treat $\widehat{\mathscr{C}^{\mathrm{op}}} \coloneqq [\mathscr{C}, \mathsf{Vect}]$ as a (closed) monoidal category, we implicitly equip with the convolution tensor product. Analogously, one may define a closed monoidal structure on $\widehat{\mathscr{C}} \coloneqq [\mathscr{C}^{\mathrm{op}}, \mathsf{Vect}]$. Note, however, that in this case we cannot simplify the internal hom in the same way as in Remark 2.125; this would require the category $\mathscr{C}^{\mathrm{op}}$, as opposed to $\mathscr{C}$ itself, to be closed monoidal.

The convolution structure is particularly well-behaved on representables:

$$\mathscr{C}(-, x) * \mathscr{C}(-, y) = \int^{a,b \in \mathscr{C}} \mathscr{C}(-, a \otimes b) \otimes_{\Bbbk} \mathscr{C}(a, x) \otimes_{\Bbbk} \mathscr{C}(b, y) = \mathscr{C}(-, x \otimes y)$$

This connection extends to the entire functor category, see [Day71; IK86].

Proposition 2.127. *For a monoidal category $\mathscr{C}$, the Yoneda embedding*

$$\text{よ} \colon \mathscr{C} \longrightarrow \widehat{\mathscr{C}} = [\mathscr{C}^{\mathrm{op}}, \mathsf{Vect}], \qquad x \longmapsto \mathscr{C}(-, x) \tag{2.8.9}$$

is a strong monoidal functor.

2.9 (co)completions

In this subsection we give a brief—informal—account of the results regarding the monoidal pseudofunctoriality of cocompletions and the resulting (co)completion operations for monoidal and module categories. We refer to [Kel05; KS06] for generalities on (co)limits and (co)completions. We implicitly assume all categories and functors to be $\Bbbk$-linear.

Let Φ be a class of diagrams. We say that a category is Φ-*cocomplete* if it admits colimits of functors with domain in Φ, and we say that a functor is Φ-*cocontinuous* if it preserves such colimits.

Definition 2.128. A monoidal category $\mathscr{C}$ is called *separately* Φ-*cocontinuous* if $\mathscr{C}$ is Φ-cocomplete and its tensor product is separately Φ-cocontinuous.

Similarly, for a Φ-cocomplete monoidal category $\mathscr{D}$, a $\mathscr{D}$-module category $\mathscr{M}$ is said to be separately Φ-cocontinuous if $\mathscr{M}$ is Φ-cocomplete and the action $- \triangleright_{\mathscr{M}} =$ is separately Φ-cocontinuous.

51

Figure 5: Equation numbers are being pushed into the margin.

which looks much better in both cases! This means one again has the power — and pain — of choice. I still think that, for this kind of technical text, the look and feel of an old-style font such as Palatino just fits the general "vibe" better, but your mileage may vary.

4.2 Customising `newpx`

The `newpxtext` and `newpxmath` packages come with an awful lot of knobs to turn. To make a long story short, the full code I ended up using looks like this:

```
\usepackage[osf,scosf,theoremfont,tighter,
  largesc,trueslanted,p]{newpxtext}
\linespread{1.05}% A bit more leading
\usepackage[amsthm,upint]{newpxmath}
\usepackage[cal=boondoxupr,frak=esstix,
  frakscaled=0.95]{mathalfa}
```

These options are all explained in the relevant manuals, so I will not dwell on them too much here. Some important notes:

- `p` uses proportional figures instead of tabular ones.
- `osf` and `scosf` make sure to enable oldstyle figures everywhere, even within small caps, and `largesc` slightly increases the size of small caps. This more accurately models the size used by Linotype's version of Palatino (the default value here is really more petite caps than small caps).
- `theoremfont` changes the default font used for the plain theorem style of amsthm, which I use for theorems, corollaries, and the like. It keeps the text itself in italics, but uses upright figures, parentheses, and punctuation symbols. In my opinion, this ends up looking much better — no one likes looking at slanted parentheses.

The `newpx` manual doesn't read quite as nicely as that of `mathalfa` or `memoir`, but it's still worth a look to get a feeling for all of the different options.

5 Odds and ends

There are lots of small macros that nonetheless were rather large quality of life improvements. For example, the following, inspired by [4], creates an environment with an immediate reference to an already existing theorem, proposition, and so on, which you might want to use in an introduction.

```
\newtheorem*{rep@theorem}{\rep@title}
\newenvironment{reptheorem}[1]{%
```

```
  \def\rep@title{\cref{#1}}%
  \begin{rep@theorem}%
  }{%
  \end{rep@theorem}%
}
```

One can use it just like a regular `theoremstyle`. For example, suppose we define a theorem like this:

```
\begin{theorem}\label{thm:label}
  An example theorem.
\end{theorem}
```

The output of which is:

Theorem 1. *An example theorem.*

If we'd like to quote it in an introduction, perhaps in a slightly simplified form, we can use:

```
\begin{reptheorem}{thm:label}
  A theorem.
\end{reptheorem}
```

And the result is the normal-looking:

Theorem 1. *A theorem.*

where the number 1 is an automatic reference to the "real" theorem in the text. That is, with `reptheorem` there is no need to put the `\ref` directly into the title, which doesn't have any good results.

Using `cleveref` saves one from having to define many different commands, such as `reptheorem`, `repcorollary`, and so on — no going around obsessively checking whether a theorem became a proposition a while ago, as inevitably happens.

5.1 Adjusting BibLaTeX

One change has to be made to BibLaTeX when using a font's oldstyle figures: the references — being mainly comprised of uppercase letters in the `alphabetic` citation style — should nevertheless use lining figures. Changing the relevant field format to

```
\DeclareFieldFormat{labelalpha}%
                   {\liningnums{#1}}
```

gets us as much.

Further, as I am not American, I very much wanted an Oxford comma in between enumerations containing at least three things. This is a little bit more fiddly, but essentially also just involves changing the field format:

```
\DeclareDelimFormat{finalnamedelim}{%
  \ifnumgreater{\value{liststop}}{2}{,}{}%
  \addspace\bibstring{and}\space}
```

5.2 Microtype

I'm quite happy with `microtype`'s default settings. I merely added a little bit more tracking to small caps and protrusion to sub- and superscripts:

```
\usepackage[tracking=true]{microtype}
\SetTracking{encoding=*,shape=it*}{10}
\SetTracking{encoding=*}{10}
\SetProtrusion%
  {encoding=T1,size={7,8}}
  {1={ ,750},2={ ,500},3={ ,500},
   4={ ,500},5={ ,500},6={ ,500},
   7={ ,600},8={ ,500},9={ ,500},0={ ,500}}
```

Also, don't forget the usual incantation to disable protrusion for the table of contents!

```
\microtypesetup{protrusion=false}
\tableofcontents
\microtypesetup{protrusion=true}
```

6 Conclusion

As I said at the beginning, I am under no illusion that this article will settle any of the hard questions of thesis typesetting. However, perhaps some of this material is useful — or at least amusing — to other people. While this is of course more of a creative endeavour than anything else, some choices like pushing equation numbers into the margin so figures can be a bit bigger do seem to have an impact on legibility; at least empirically.

References

[1] R. Bringhurst. *The Elements of Typographic Style*. Hartley & Marks, 1992.

[2] D. Carlisle. Placing the equation number in the left-hand margin. TeX Stack Exchange, 2015. tex.stackexchange.com/a/258575

[3] C. Niederberger. Bringhurst chapter style in memoir. TeX Stack Exchange, 2013. tex.stackexchange.com/a/88986

[4] A. Stacey. How do I repeat a theorem number? TeX Stack Exchange, 2010. tex.stackexchange.com/a/443

[5] H. Vogt. Bad spacing of math letters within italic text. TeX Stack Exchange, 2010. tex.stackexchange.com/a/4939

[6] T. Zorman. *Categorical Reconstruction Theory*. Ph.D. thesis, TU Dresden, 2025. nbn-resolving.org/urn:nbn:de:bsz:14-qucosa2-979696

[7] T. Zorman. Categorical reconstruction theory (source code), 2025. github.com/slotThe/dissertation

[8] T. Zorman. Dissertation typesetting considerations, 2025. tony-zorman.com/posts/phd-typesetting.html

◇ Tony Zorman
mail (at) tony-zorman.com
https://tony-zorman.com
ORCID 0009-0009-4940-2864