

The Curse of Knowledge

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PLMW 2017, Paris

About me...

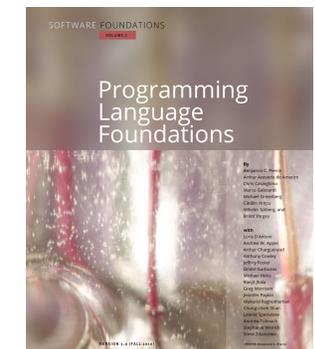
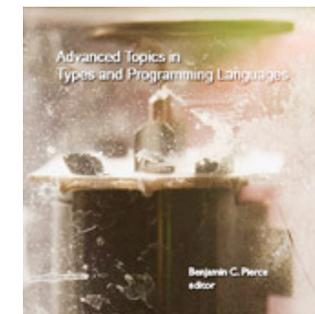
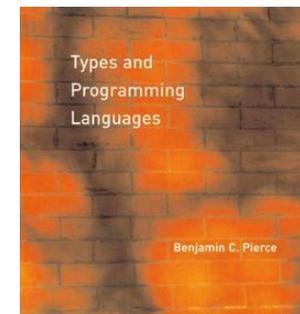
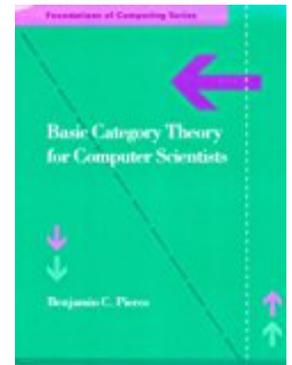
PhD from CMU

- advised by Bob Harper and John Reynolds

Postdocs at Edinburgh, INRIA,
Cambridge

Taught at Indiana University

Now at University of Pennsylvania



Research

=

Creating and sharing useful ideas

Research

=

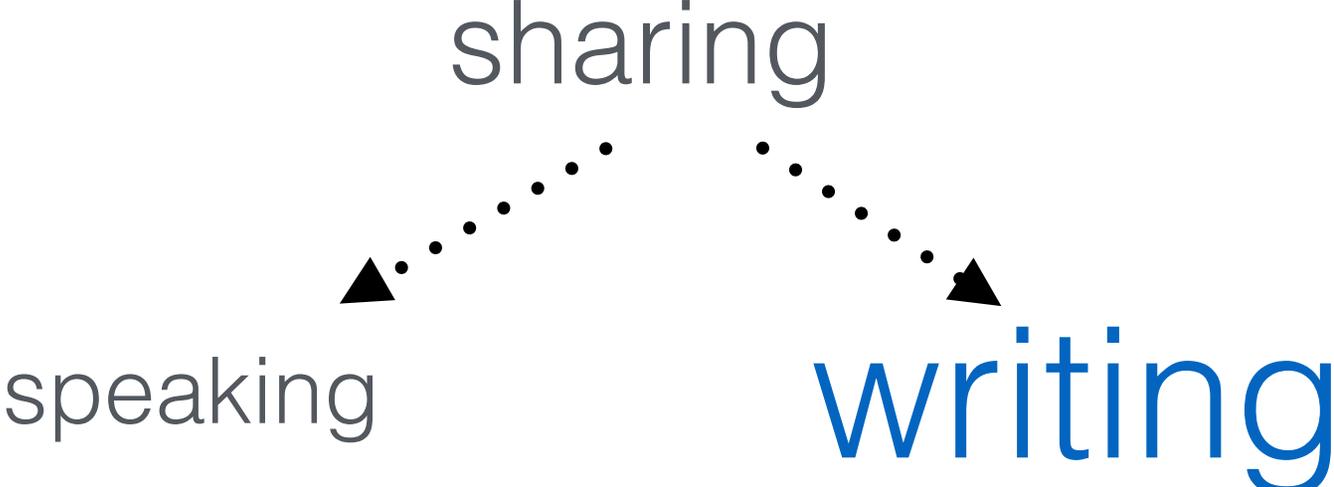
Creating **and sharing** useful ideas

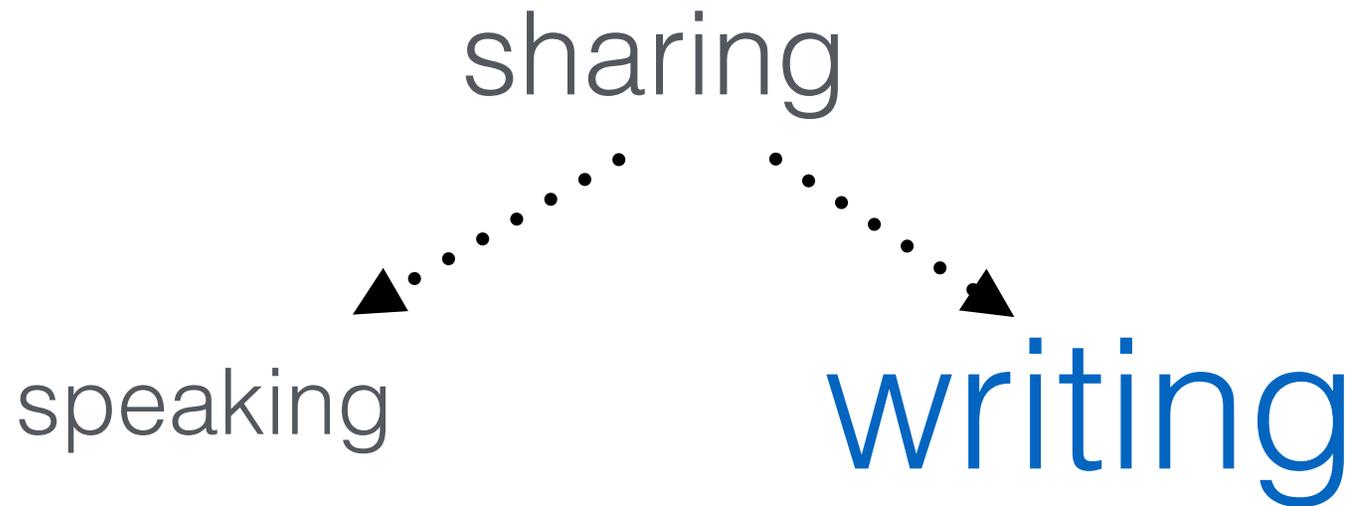
sharing

speaking

writing





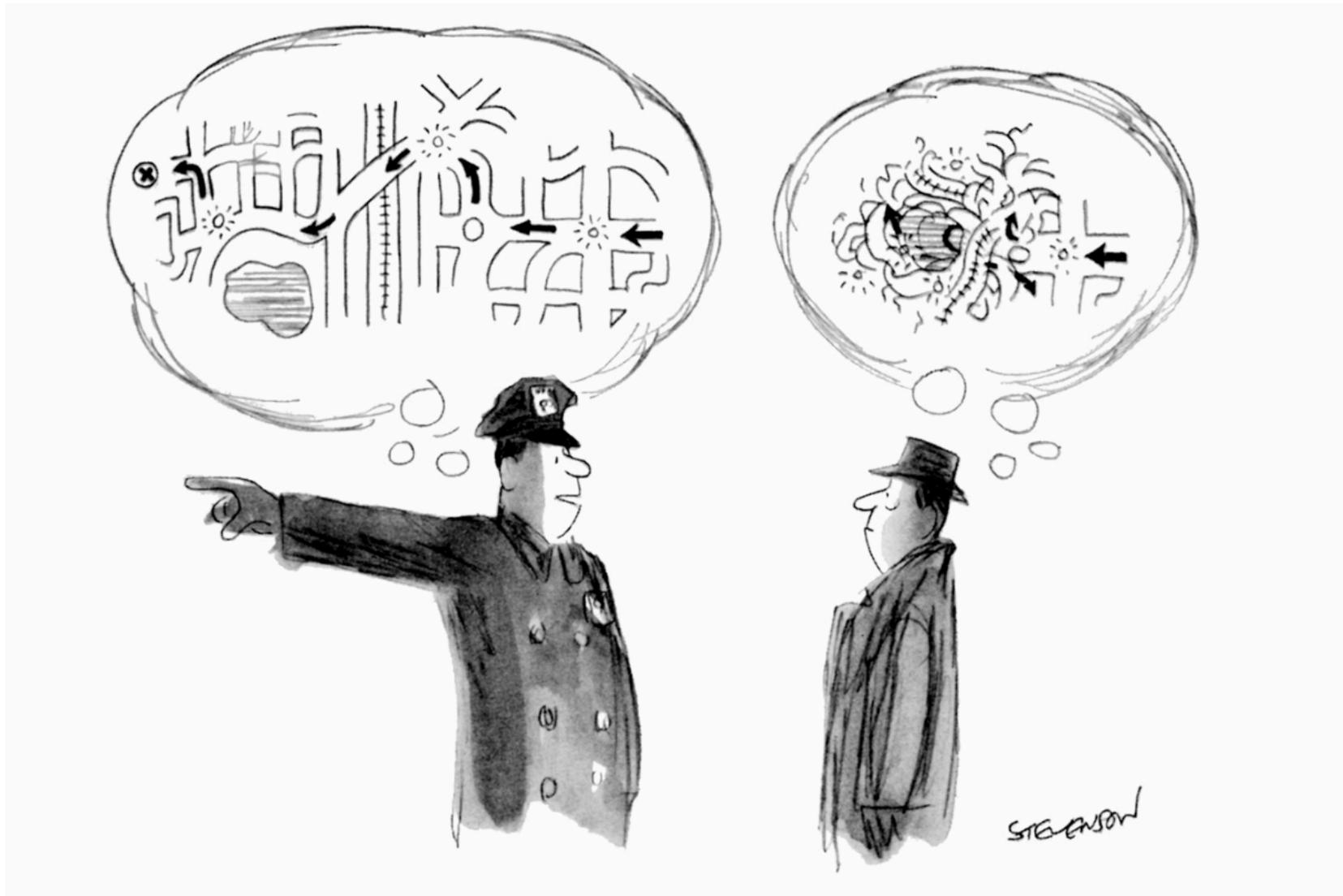


“Easy reading is damn hard writing” (Hawthorne)

The Curse

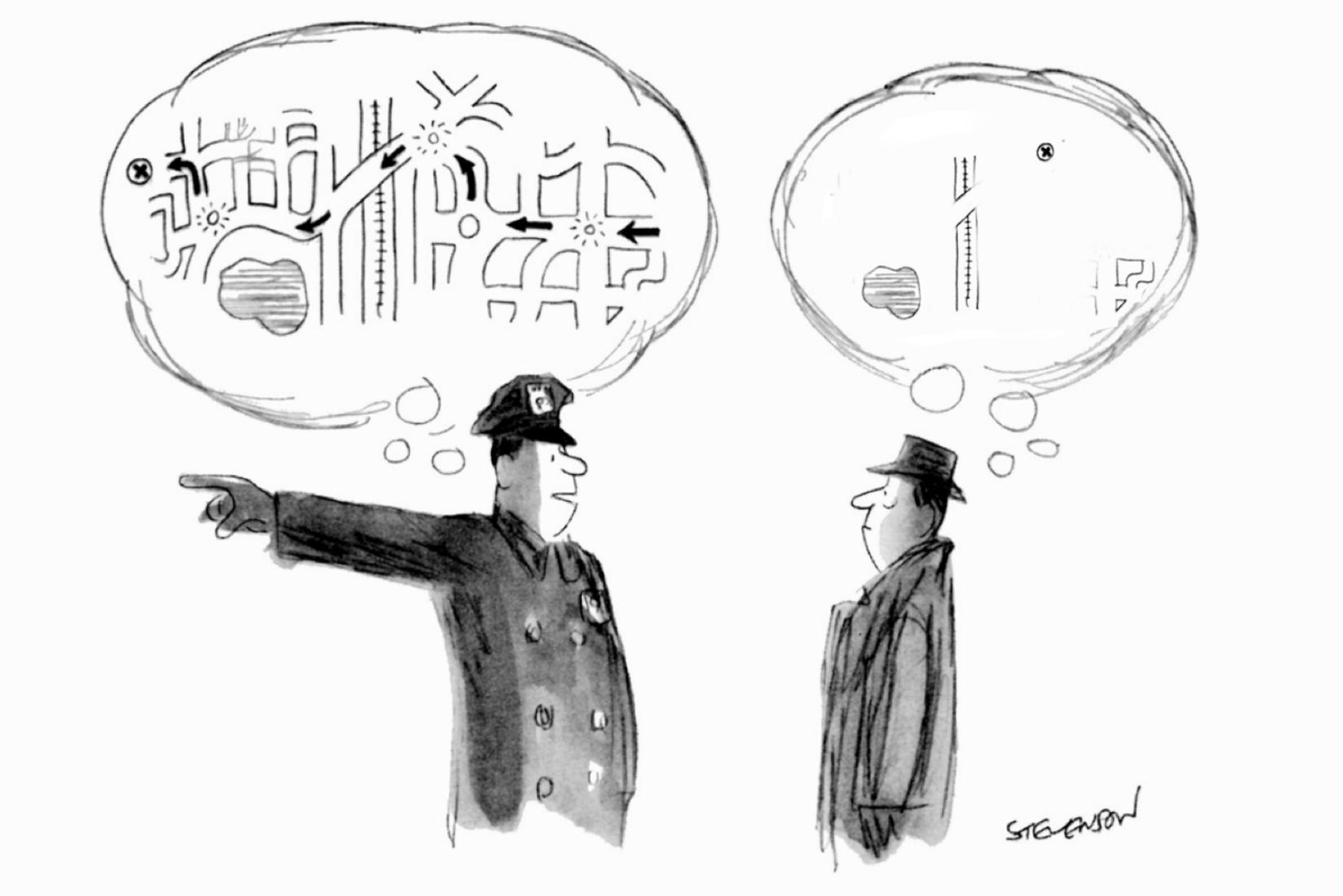
The main cause of incomprehensible prose is the difficulty of imagining what it's like for someone else not to know something that you know.

Steven Pinker, "*The Sense of Style*"





STEVENS



Dealing with the Curse

(some proven strategies)

Ground your imagination

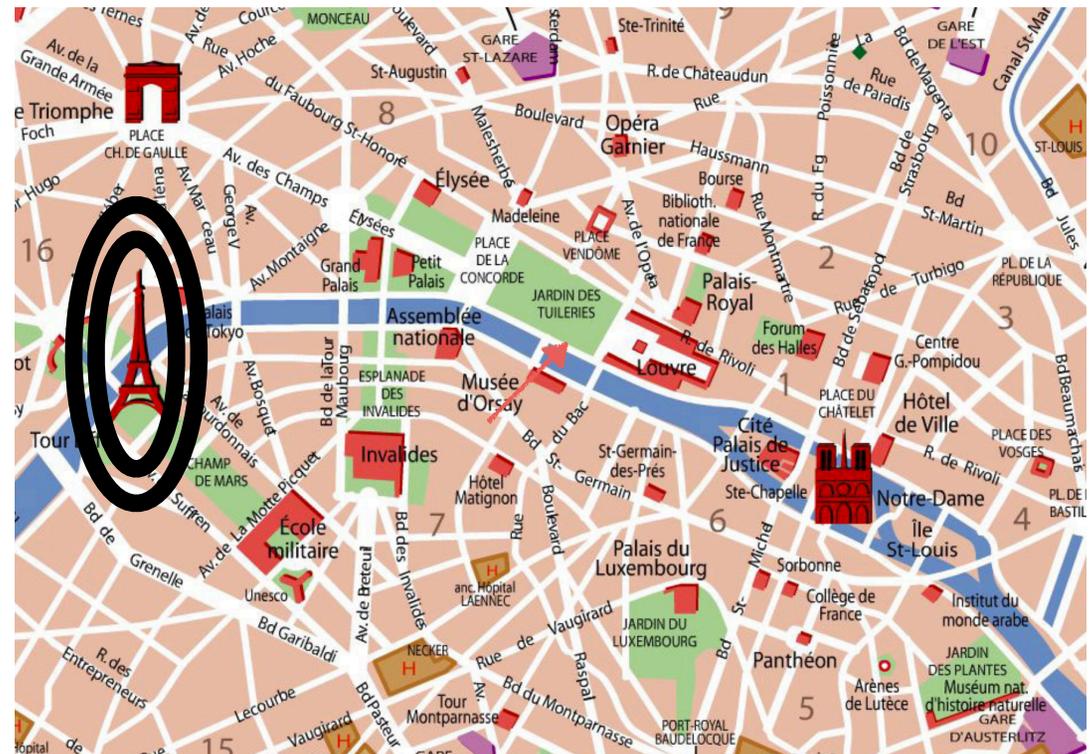
Pick a “canonical reader”

- Someone you actually know
- With the *minimum* expertise you expect
 - e.g., a beginning PhD student with some coursework in PL
- Imagine explaining your idea to them at the whiteboard

Articulate the Main Idea

Concise summary of the problem and your solution

A “landmark” that can be seen from every part of the paper



State the Contributions

Write them early

Every bit of the rest of the paper must relate to them

A concise summary of what the paper *contributes*

- I.e., specific, significant advances that will be valuable to others
- *Not* just a laundry list of what you did
- Make sure it is clear why each point counts as a contribution

Each point should be both *strong* and *falsifiable*

Bad

Our contributions are:

- We define the $\lambda_{whizbang}$ calculus.
- We study its properties.
- We describe an implementation.
- We measure the performance of the implementation.

Good

Our contributions are:

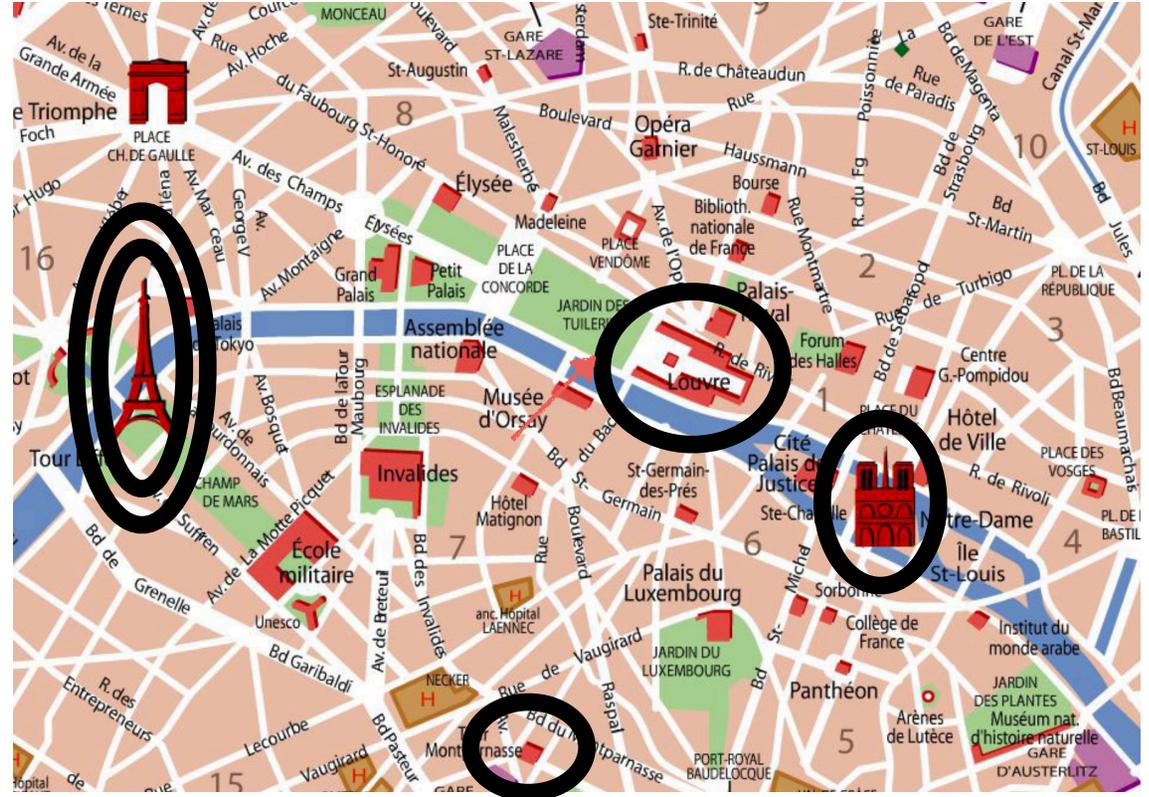
- We present the $\lambda_{whizbang}$ calculus and prove that it has properties P and Q, settling the open question proposed by Plotkin.
- We explain how to use an insight from quantum logic for the key step in an efficient implementation.
- We demonstrate empirically that our implementation performs within 10% of optimal.

Main idea + contributions

=

landmarks

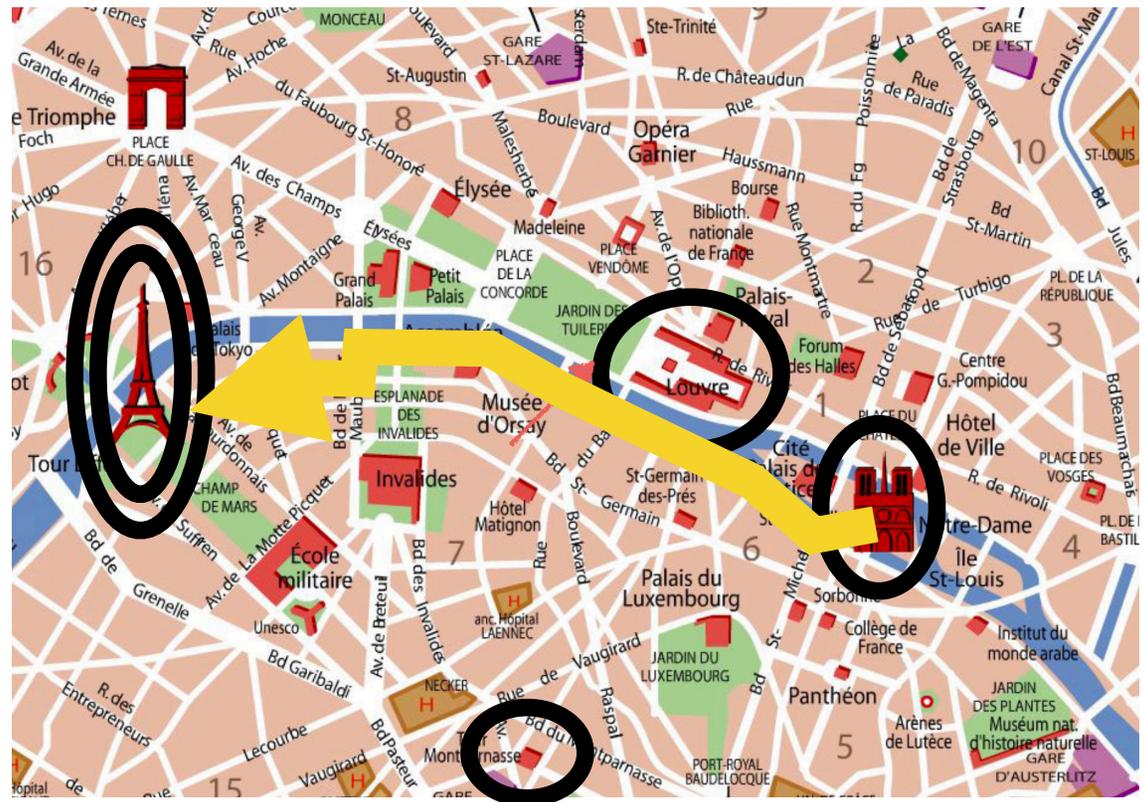
(for both reader and writer!)



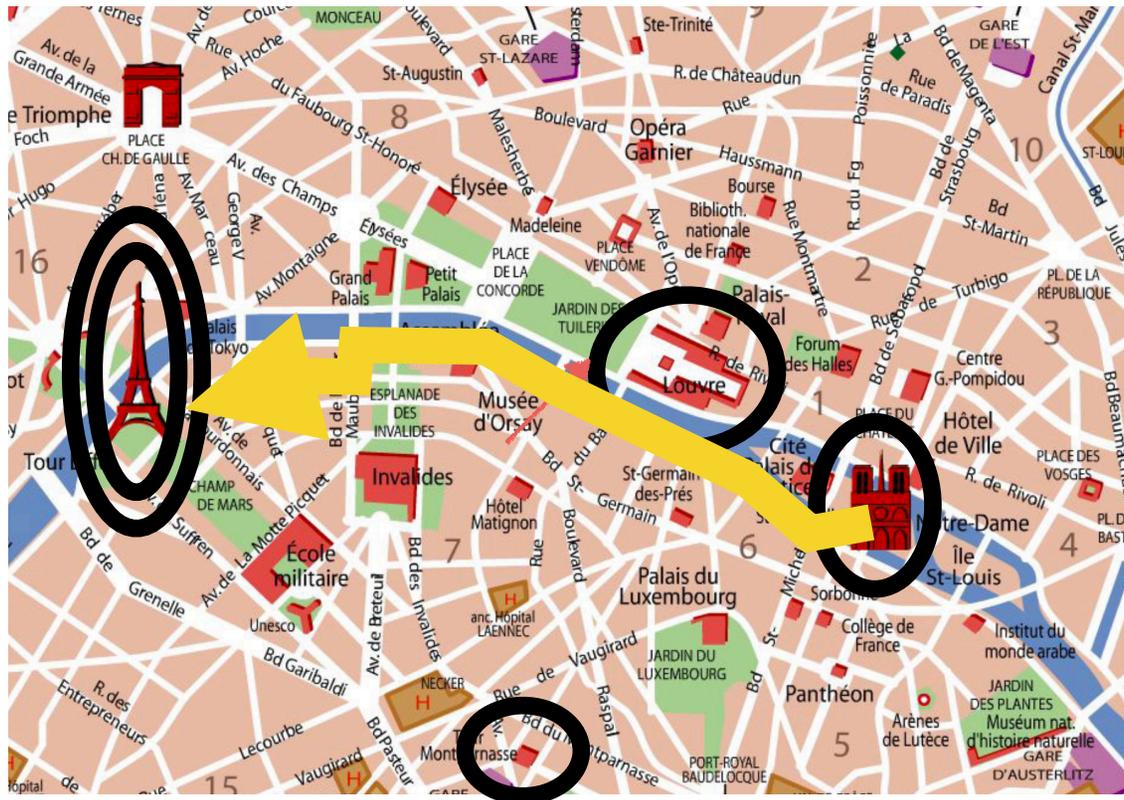
Use a Running Example

“Even a simple example will get three-quarters of an idea across” (Ullman)

A concrete illustration of the main idea
Showing just the essentials, not every subtlety



Main idea + contributions + running example
=
clear, high-level summary of paper



(meta) bad

“Them bad; us good.”

(meta) good

“Them good; us even better.”

Recap

Abstract

- Main idea + brief summary of contributions

Introduction

- Motivating example
- Contributions



- + *Enough background to understand the contributions*
- + *Nothing else!*

Background

- Review of required definitions and notations

Main ideas

- A more technical whack at the example from the intro

Details

- How it all really works

Related work

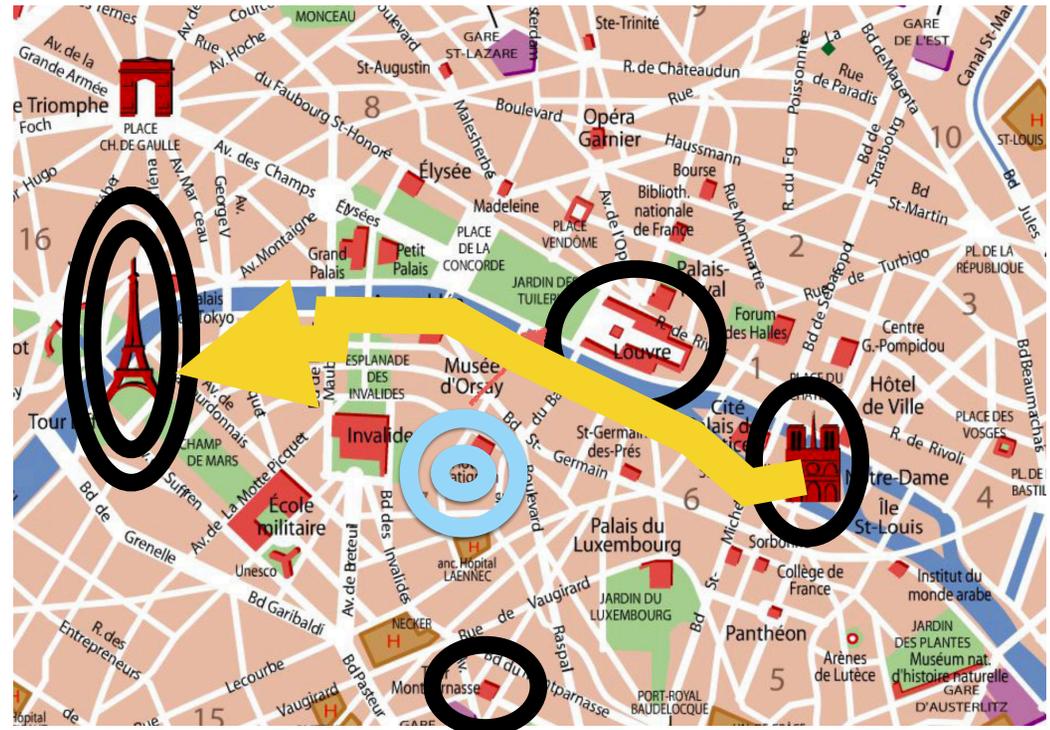
Future work

Signposting

Encourage readers (and yourself) to stop every so often, look up, and check where we are and why we are doing what we're doing

Can be lightweight:

- “Generalizing the example from the introduction, we call an expression *e* a *frobnosticator* iff...”



Close the loop

Get yourself some actual readers!

- Read to yourself, out loud
- Friends
- The competition

Mechanics

(tricks for increasing bandwidth)

Concision

Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should contain no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make all his sentences short or that he avoid all detail and treat his subjects in outline, but that every word tell.

Strunk and White, *The Elements of Style*

When you think a piece of writing is just about finished, see if you can make it 40% shorter

(Mary-Claire van Leunen)

In this section, we describe some of the highlights of the research area. We discuss some of the most significant, elegant, and useful algorithms, and some corresponding lower bound results

In this section, we discuss some of the most significant algorithms and lower bound results

— Leslie Lamport, Handout on unnecessary prose,
in Knuth, Larabee, and Roberts

Flow

Look for opportunities to link each sentence to the previous one.

Use the “main slots” in the sentence (e.g., the grammatical subject and verb) to highlight important information.

Topic, then comment. Given, then new.
—Pinker

“A man arrives from Corinth with the message that Oedipus’s father has died.... It emerges that this messenger was formerly a shepherd on Mount Cithaeron, and that he was given a baby.... The baby, he says, was given to him by another shepherd from the Laius household, who had been told to get rid of the child.”

— Wikipedia (quoted by Pinker)

Given, then new

“**A man** arrives from Corinth with the **message** that Oedipus’s father has died.... It emerges that **this messenger** was formerly a **shepherd** on Mount Cithaeron, and that he was given a **baby**.... The **baby**, he says, was given to him by **another shepherd** from the Laius household, who had been told to get rid of the **child**.”

— Wikipedia (quoted by Pinker)

Topic, then *comment*.

“A man arrives from Corinth with the message that Oedipus’s father has died.... It emerges that this messenger was formerly a shepherd on Mount Cithaeron, and that he was given a baby.... The baby, he says, was given to him by another shepherd from the Laius household, who had been told to get rid of the child.”

— Wikipedia (quoted by Pinker)

Note how the passive voice improves this passage!

“A man arrives from Corinth with the message that Oedipus’s father has died.... It emerges that this messenger was formerly a shepherd on Mount Cithaeron, and that he **was given** a baby.... The baby, he says, **was given** to him by another shepherd from the Laius household, who **had been told** to get rid of the child.”

— Wikipedia (quoted by Pinker)

Mathematical Nits

Symbols in different formulas should be separated by words

- Bad:

If $\Gamma, x \in S, \Delta \vdash e \in T, \Gamma, \Delta \vdash e' \in S,$
then $\Gamma, \Delta \vdash e[e'/x] \in T.$

- Good:

If $\Gamma, x \in S, \Delta \vdash e \in T$ and $\Gamma, \Delta \vdash e' \in S,$
then $\Gamma, \Delta \vdash e[e'/x] \in T.$

Mathematical Nits

Punctuate displayed equations as if they were running text

Bad

It thus follows that

$$x = y + z + w$$

Where $w = 42$. On the other hand

$$x' = a - b - c$$

Good

It thus follows that

$$x = y + z + w,$$

where $w = 42$. On the other hand,

$$x' = a - b - c.$$

Conventions

Good grammar, choice of words, spelling, and, yes, even punctuation matter.

1. Because problems at this level force readers to spend energy mentally rewriting your prose.
2. Because carelessness at this level turns readers off.

These are all rich subjects, each with its own rules, exceptions, gray areas, and domain-specific tricks. But the essential skills are nowhere near as hard as writing a compiler or doing proofs in higher-order logic. :-)

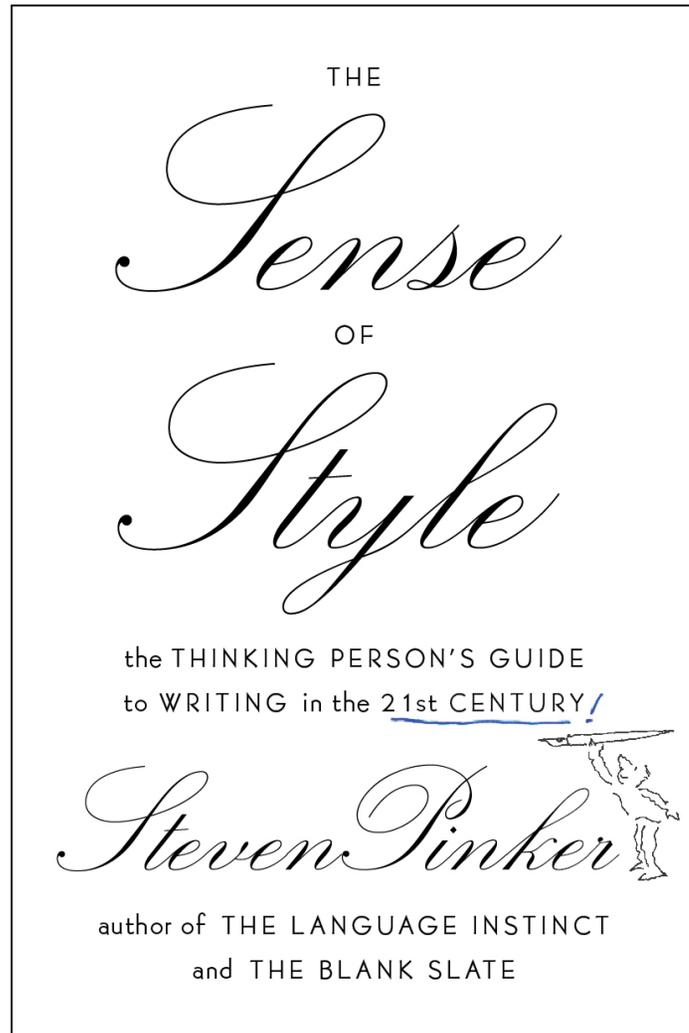
Just learn them. ‘Nuff said.

“Literate readers rely on punctuation to guide them through a sentence, and mastering the basics is a nonnegotiable requirement for anyone who writes.” — Pinker

Resources



<https://www.microsoft.com/en-us/research/academic-program/write-great-research-paper/>

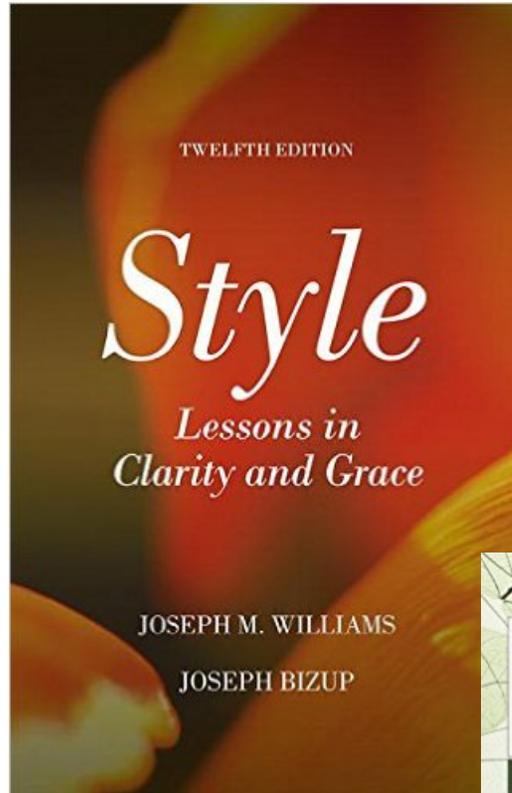


A “new classic” by a cognitive psychologist / linguist

Good advice + *reasons* why it is good

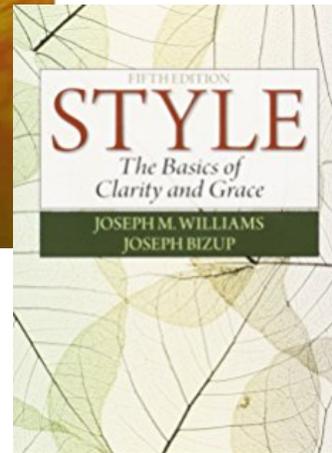


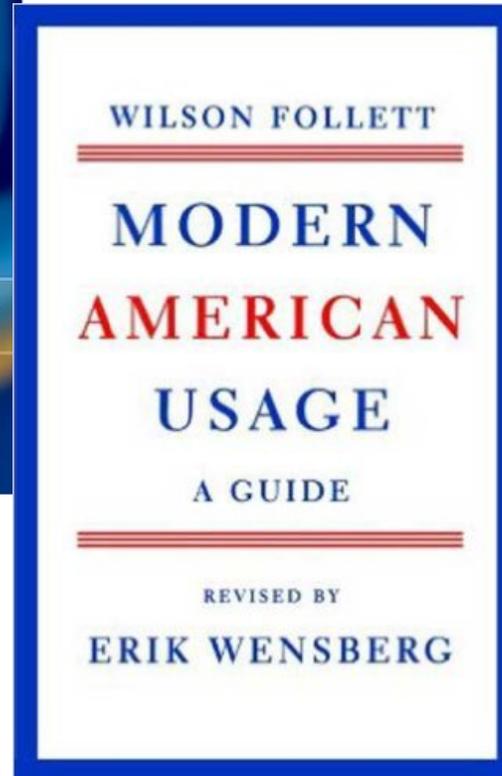
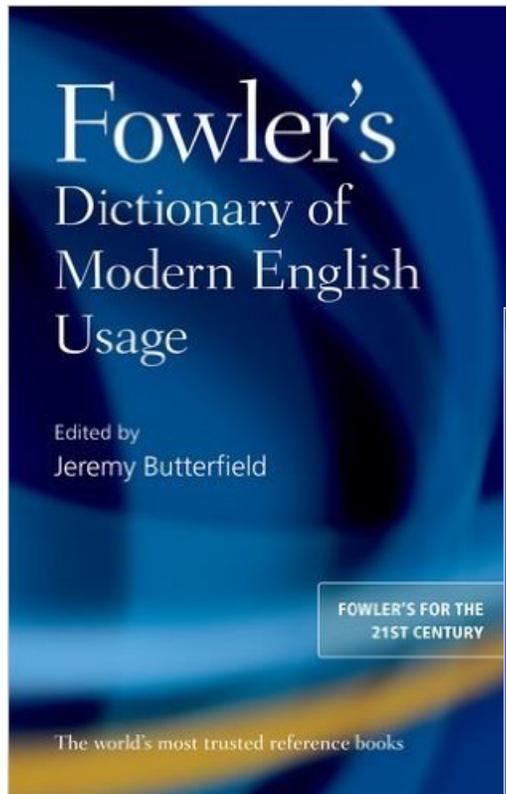
the full story



Wonderful *exercises* for developing good writing

the short-and-sweet version





Classic guides to word usage

(lay vs. lie, which vs. that, etc.)

The Chicago
Manual of
Style
16
SIXTEENTH EDITION

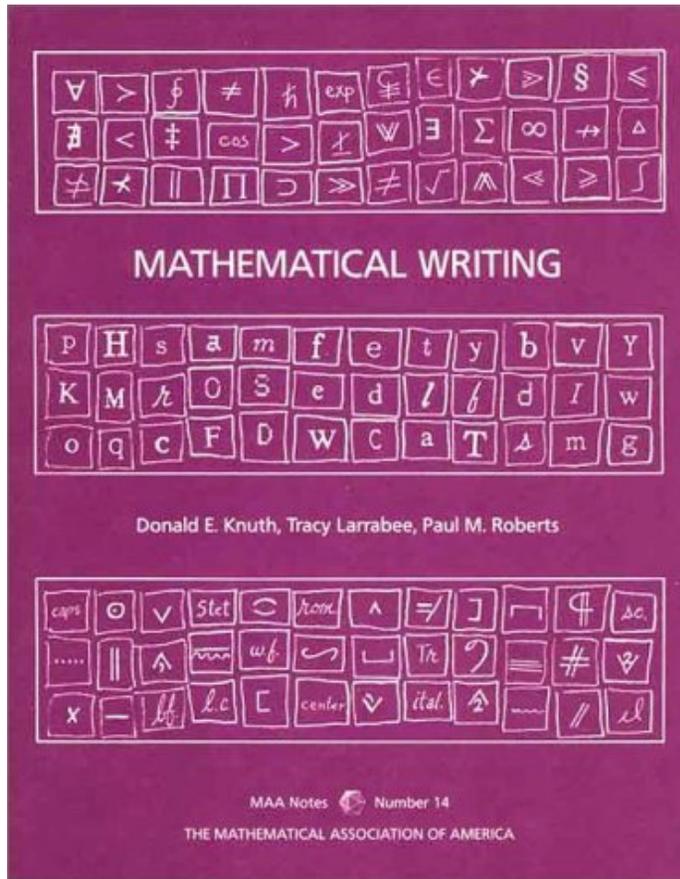
The Essential Guide for
Writers, Editors, and Publishers

One of several excellent short guides to punctuation (and lots of other issues)

Available online



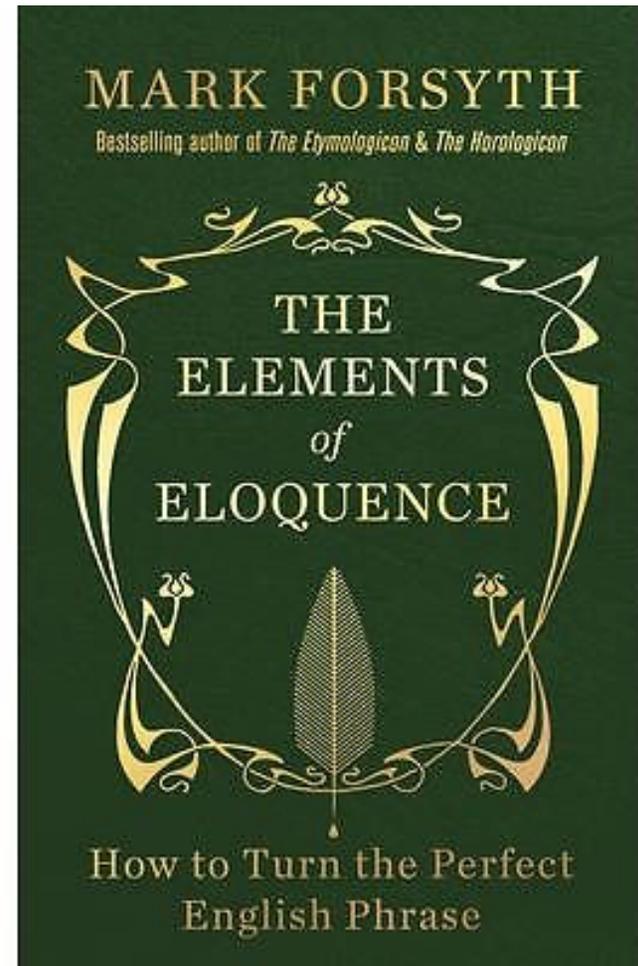
A dated classic



A wonderful collection of advice on writing from famous computer scientists and others

Available online

And if you wonder how
Wadler comes up with all
those titles...



Parting thought...

“I am told there are writers who can tap out a coherent essay in a single pass, at most checking for typos and touching up the punctuation before sending it off for publication. You are probably not one of them. Most writers polish draft after draft. I rework every sentence a few times before going on to the next, and revise the whole chapter two or three times before I show it to anyone. Then, with feedback in hand, I revise each chapter twice more before circling back and giving the entire book at least two complete passes of polishing. Only then does it go to the copy editor, who starts another couple of rounds of tweaking.”

Pinker

Good writing is mostly good *rewriting*

Questions?