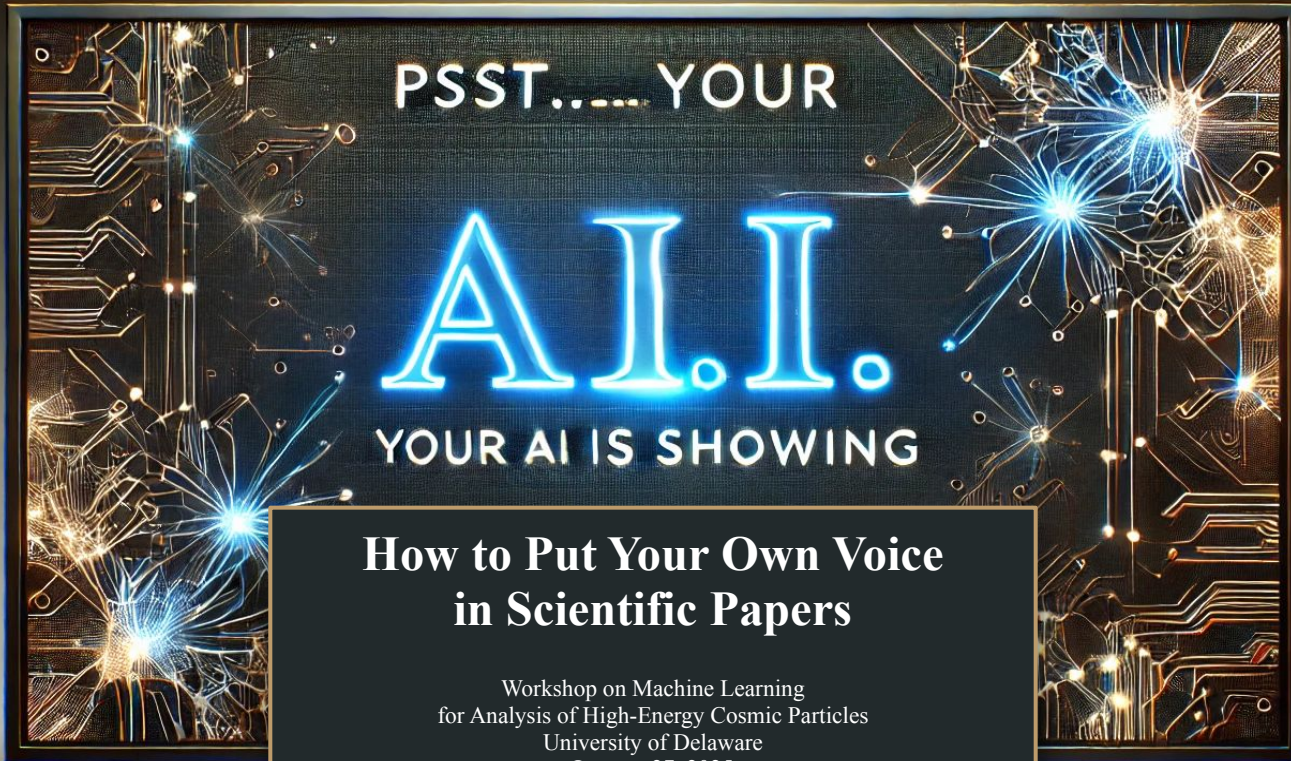


Prompt: Create a Google Slides background image for my presentation, "Psst . . . Your AI Is Showing."



## How to Put Your Own Voice in Scientific Papers

Workshop on Machine Learning  
for Analysis of High-Energy Cosmic Particles  
University of Delaware  
January 27, 2025

Jamie Zvirzdin, [jamie.zvirzdin@jhu.edu](mailto:jamie.zvirzdin@jhu.edu)



# AGENDA

Introductions (1:00 p.m.)

1. The AI Writing Voice

➤ Break (1:50 p.m.)

2. Finding Your Own Voice through Subatomic Writing (2:00 p.m.)

➤ Break (2:50 p.m.)

3. Real-World Example: APA-Edited Article for Publication (3:00 p.m.)

➤ End (3:50 p.m.)

Linger Longer: Publication questions (3:50–4:30 p.m.)

# Introductions

About Me

About You

About Melba

Who is Jamie Zvirzdin?



Jamie Zvirzdin - Jamie Zvirzdin

Jamie Zvirzdin

Jamie Zvirzdin is a researcher and educator specializing in ultrahigh-energy cosmic rays and science writing. She is affiliated with the Telescope Array Project at the University of Utah, where she operates fluorescence detectors and applies machine learning techniques to analyze cosmic-ray data. SUBATOMIC WRITING

In addition to her research, Zvirzdin has taught graduate-level science writing at Johns Hopkins University, earning the Excellence in Teaching Award in 2019 and the Distinguished Professional Achievement Award in 2023. JAMIE ZVIRZDIN She is the author of "Subatomic Writing: Six Fundamental Lessons to Make Language Matter," a guide that links principles of physics with those of grammar and linguistics to enhance scientific communication. AMAZON

Her essays have been featured in publications such as The Atlantic, Kenyon Review, and Orion Magazine. JAMIE ZVIRZDIN Zvirzdin also writes a monthly "Citizen Science" column for newspapers in central New York. SUBATOMIC WRITING She has lived in various countries, including Germany, where she currently resides with her family. JAMIE ZVIRZDIN

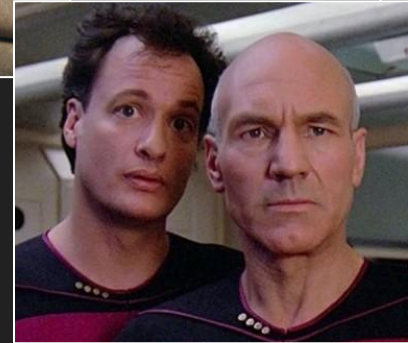
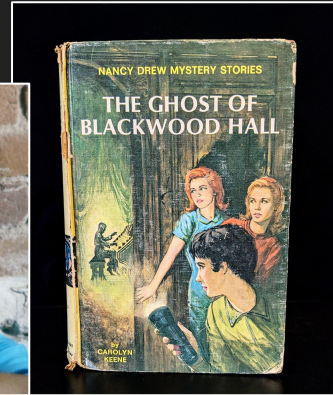
Sources



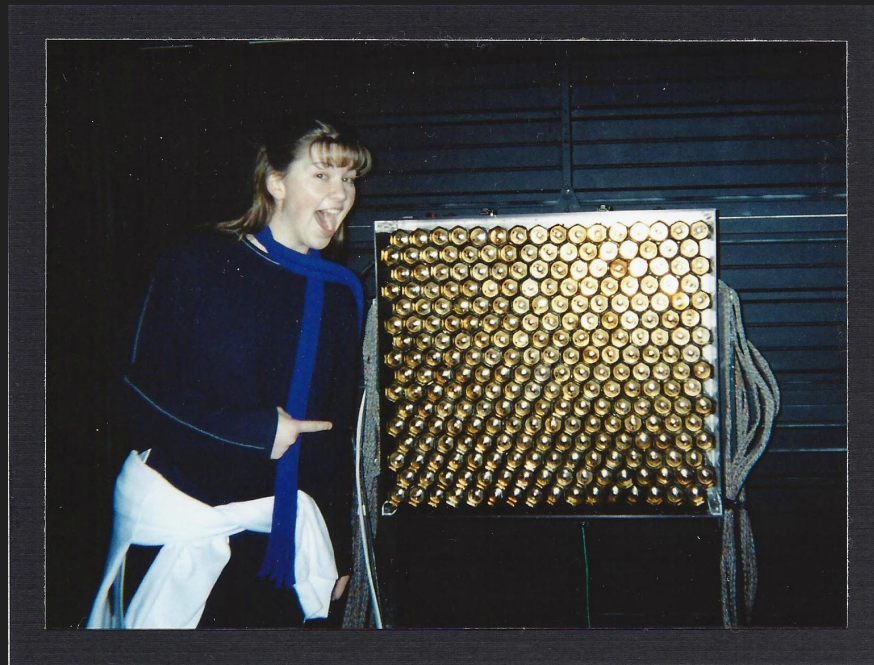
# About Me



[www.jamiezvirzdin.com](http://www.jamiezvirzdin.com)

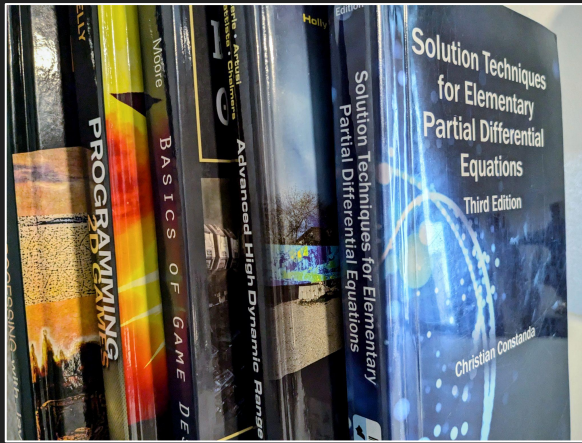


Heroes



High Resolution Fly's Eye (1999–2001)

Telescope Array (2018–present)



A K Peters/CRC Press/  
Taylor & Francis

- 2008–present: Science/technical/freelance editing
- 2015–present: MFA in Writing & Literature, publishing science essays/books
- 2015–2018: K–12 and Undergrad Astronomy teaching in Nicaragua until the U.S. Embassy evacuation
- 2017–2023: Johns Hopkins AAP teaching, Science Writing grad program
- 2018–present: Telescope operator/programmer at Telescope Array (U. of Utah)
- 2022–present: Applied Physics master's degree, JHU Whiting School

<p><b>EL PAÍS</b> <b>SOCIEDAD</b></p>  <p><b>derStandard.at</b></p>	<p>"Bomb Technology May Contain the Secret of Life" by Dieter Braun, Ludwig Maximilians University of Munich</p> <p>British-English Editing for Atomium Culture</p>	<p><b>Frankfurter Allgemeine Wissen</b></p> 	<p>"Vitamin E: Mehr als nur ein Oxidationsschutz" by Sergi Munne-Bosch, University of Barcelona</p> <p>British-English Editing for Atomium Culture</p> <p>"The Poetry of Butterflies: Using Geometric Concepts to Solve Problems in Quantum Mechanics" by Gianluca Panati, University of Rome la Sapienza</p> <p>British-English Editing for Atomium Culture</p>
---	---	---	--

Atomium Culture

"Citizen Science" Newspaper Column

**The Freeman's Journal**  
COOPERSTOWN'S OFFICIAL NEWSPAPER  
FOUNDED IN 1808

**HOMETOWN ONEONTA**  
& The Otsego-Delaware Dispatch

**AllOTSEGO.com**



# Our Own Neural Networks

Your brain is the ultimate multipurpose problem-solving machine:

- adaptable,
- fast ( $\sim 1$  exaFLOP\*),
- robust,
- creative, and
- energy-efficient (20 watts vs. 20 megawatts).

Have a little faith in it when it comes to writing!



[NIST](#)  
[PCMag](#)  
[DOE](#)  
[Wikipedia](#)

\*1 exaFLOP = 1,000,000,000,000,000,000 floating point operations per second (FLOPS).



# About You

What's your name?

Where are you from?

What do you want to write/publish?

# Macro Considerations

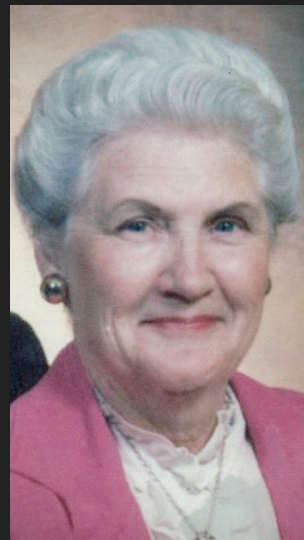
- What do you want to write? Who is the audience? Where do you want to publish? What style guide do they use? What house style guide do they use? What is the focus of your paper? How will you organize it? What are your arguments? What is the maximum word count?

What	Which	For Whom
Book, Essay, Magazine Article	Chicago	Lay audience, specialized audience
Newspaper Article	AP Style	Lay audience
Science Paper	APA	Academic
Lit Paper	MLA	Academic

# About Melba

AI is most reliable thus far as a patient, egoless tutor 🙌🙌🙌

- Giving definitions in plain language,
- Providing examples,
- Explaining concepts via analogy,
- Pinning down jargon, and
- Never shaming you for asking questions.



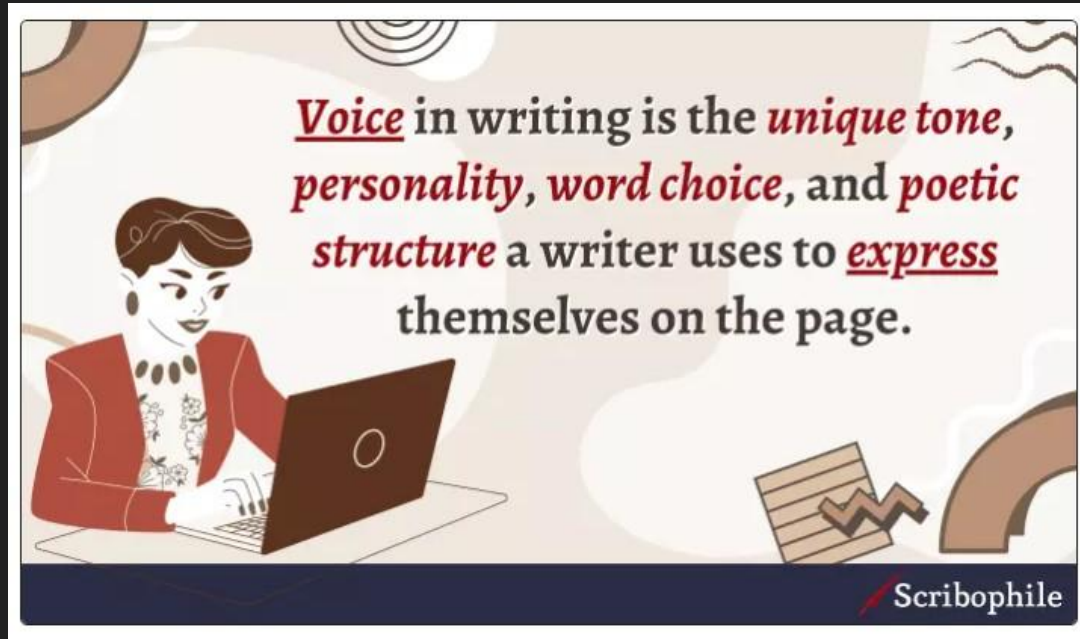
Melba Kaye Penman

“Melba” is my catch-all name for all AI chatbots.

April 27, 2023 NY newspaper article (0% written by AI, 100% written by JZ):

**AI Renaissance: A Chance to Reduce Cheating, Revitalize the School Experience**

# The AI Voice



[Link](#)



# Forensic Linguistics: ChatGPT's Voice

Explain the statement "English is an algorithm" in five concise sentences to an audience well-versed in machine learning.

The statement "English is an algorithm" frames the language as a structured set of rules and patterns for generating and interpreting meaning, similar to how algorithms process inputs to produce outputs. Grammar, syntax, and morphology function like rule-based systems that govern the construction of valid sentences, enabling predictable and consistent communication. Ambiguities and exceptions in English parallel non-deterministic elements in algorithms, requiring probabilistic models like those used in NLP. Human speakers encode thoughts into language by following implicit rules, and listeners decode these signals to reconstruct meaning, akin to encoding and decoding in information theory. Thus, English can be viewed as a linguistic algorithm that balances rule-based processing with flexibility and creativity.

Is the statement true? Answer in one sentence why or why not.

The statement is **partially true** because while English follows structured, algorithm-like rules for grammar and syntax, its flexibility, creativity, and ambiguities go beyond the deterministic nature of traditional algorithms.

- Blandly perfect grammar (perfect usage of the serial comma, perfect usage of that/which, hyphens, dashes, & more)
- Overreliance on present participial adjectives ("enabling," "requiring")
- Overuse of S+V+DO valency pattern ("speakers encode thoughts")
- Overreliance on conjunctive adverbs ("Thus,") and favorite words ("akin")
- Low yield of meaning (too many words per concept; lack of concision)
- Overuse of abstract words from Latin.



## Chart: Brain vs. AI for Writing a Scientific Paper

Aspect	Using One's Own Brain	Using AI
Creativity	High: Generates novel ideas and unique perspectives.	Moderate: Mimics creativity but lacks originality.
Understanding	Deep: Reflects genuine comprehension of the topic.	Superficial: Based on patterns in training data, no real understanding.
Accuracy	Reliable, but subject to human errors in details.	Can quickly retrieve facts but may produce inaccuracies or fabrications ("hallucinations").
Efficiency	Slower, requires significant time and effort.	Very fast: Can produce drafts in seconds.
Personalization	Tailored to the writer's style and goals.	Mimics tone but struggles to fully match personal style or purpose.
Critical Thinking	Engages deeply with the topic, fostering learning.	Lacks critical thinking; outputs pre-trained knowledge without reasoning.
Ethics	Unquestionably ethical if original work is produced.	Raises concerns about plagiarism, bias, and misuse of sources.
Cost	Free, aside from time and effort.	May require access to premium AI tools.
Energy Efficiency	Extremely efficient in terms of power consumption (just your brain!).	Computationally expensive, especially for large models.
Final Product Quality	High, if the writer is skilled and thorough.	Variable: High for general content, lower for complex, nuanced topics.

Prompt: Make a concise chart showing pros and cons for using one's own brain to write a scientific paper versus using AI to generate a scientific paper.

### “Conclusion

- Use your **own brain** for originality, deep understanding, and ethical integrity.
- Use **AI** as a tool for speed, brainstorming, and simplifying repetitive tasks, but review its output carefully for errors or ethical concerns.”



# When to Use AI in Science Writing

1. Soundboarding your ideas: 💕💕📡
2. Global ghostwriting: 🖐️🖐️🖐️
3. Global editing: 🤖🤖🤖
4. Answering specific writing questions: 😐
5. Answering specific editing questions: 😐
6. Answering specific publishing questions: 😊
7. Getting unstuck from writer's block: 😌
8. Smoothing out a particularly awkward sentence: 😎
9. Turning a direct quotation into an indirect quotation: 😍
10. Receiving a totally wrong answer that oddly inspires you think of the right answer: 😂👍

# Example of #10 from “The City of Wisdom”

How can I say this better?

The physicality of these physics stories gives our brains a concrete starting point to pin information to.



The tangible nature of these physics stories provides our brains with a solid foundation to anchor new information.



roadmap. It is a critical one.

The power of science stories like this lies in their concrete details, an insight that not only helps us be more interesting teachers of physics but also better communicators when reporting our findings. Hess in a balloon, the high altitude, the sensation of flight, the cold metal of the electroscopes – these finite, sensory elements help anchor concepts like cosmic-ray radiation in our minds. As I learned when I did my MFA in writing and literature at Bennington College, using vivid imagery and sensory details – anything you can see, touch, taste, smell, hear – makes new, complex information easier to absorb and remember. As you follow the scientific method, keeping track of these details makes it easier to recount what happened and what you did.

Actual final essay in *Aeon Magazine*, November 1, 2024  
<https://aeon.co/essays/to-understand-physics-we-need-to-tell-and-hear-stories>



# Identifying Strengths:

Let's talk about my essay for Aeon Magazine. Let's go through its strengths and suggest places for concision. Here is the first section (it's supposed to be 3,000 words total).

Advancing Patterns of Thought: Using Skills from Language Arts to Master Physics

In 1961, on the heels of C. P. Snow's influential 1959 lecture, "The Two Cultures," Norton Juster published *The Phantom Tollbooth*. It was a funny, punny allegorical fantasy that captivated kids well into the 1990s. This was when I first read how Milo, a boy already besieged by adult-like ennui and existential despair, takes on the quest to bring back the princesses Rhyme and Reason, reuniting them with their two quarrelsome brothers: King Azaz the Unabridged, Ruler of Dictionopolis, and the Mathemagician, Ruler of Digitopolis.



## Strengths:

1. **Personal Narrative:** The essay opens with a compelling and relatable personal journey. This blend of personal experience with broader cultural and intellectual themes draws the reader in and makes the essay more engaging.
2. **Cultural Context:** The discussion of the "Third Culture" (religion) adds depth and layers to your story, making the essay unique. It grounds the intellectual journey in real-world struggles, which broadens the appeal.
3. **Connections Between Disciplines:** The essay sets up an intriguing exploration of how literary and scientific skills interact. This core idea—how language and narrative skills enrich scientific understanding—feels fresh and insightful.
4. **Achieved Accomplishments:** Highlighting your achievements—editing science textbooks, teaching science writing, and returning to physics—provides a sense of progress and makes the story inspirational.

## Suggestions for Concision:

1. **Opening Paragraph:**
  - The references to *The Phantom Tollbooth* are engaging, but a bit long. You can trim it slightly without losing its impact.

Suggested places for concision are hit-and-miss. Some are OK but others are flat-out wrong or debatable.

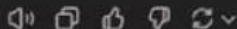
# Asking AI to Mimic Your Voice: 🙄🙄🙄

Act as a skilled content writer. I'll show you my written examples, and you'll analyze them to replicate my tone and style.

First, say 'GO'. I'll show you examples one by one, and after each one, you'll respond with 'PROCEED'. Continue this until I say 'COMPLETE'. Then, analyze my style for tone, vocabulary, and structure and replicate my style.



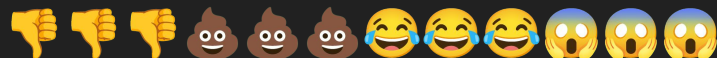
**Document 1.docx**  
Document



👎👎👎💩💩💩😂😂😂😱😱😱

aders in enterprise AI for  
king insights and

# Asking AI to Generate Your Science Paper:



From “AI et al.” [Clinical eHealth](#)

Certainly, here is the revised paragraph:

By solving Equation (8), the parameters  $a$ ,  $b$ , and  $c$  are computed. In this context,  $y$  represents the demand,  $x_{1i}$  and  $x_{2i}$  denote historical independent variables, and  $X_{ni}$  (where “ $n$ ” depends on the independent variables) refers to additional variables. Furthermore, “ $n$ ” stands for the number of  $y$  forecasted.

[View Article](#) • [Google Scholar](#)

62. Picciano A. G., & Seaman J. (2017). *Blending in: The extent and promise of education in the United States*. Babson Survey Research Group. Retrieved <https://files.eric.ed.gov/fulltext/ED581301.pdf> [Regenerate response](#)

63. Oubiki M., Zhou Y., Oubiki A., Futo A., Saleem A. (2022). The Challenges of

technologies. The major observations and challenges are highlighted, and prospects for future development are discussed. The aim of this work is to provide suggestions and open new horizons in this research field, allowing for in-depth and broad exploration [18], [19], [20], [21], [22], [23], [24], [25].

[Regenerate response](#)

Certainly, here is the pseudo code for the specially designed spatial scene augmentation method, consisting of two main operations: similar spatial scene generation and padding. Here,  $\alpha_1$  and  $\alpha_2$  are hyperparameters representing probability thresholds. The practical values used for these

## Introduction

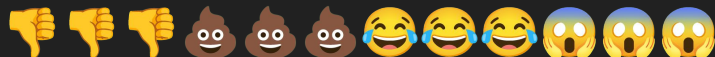
Certainly, here is a possible introduction for your topic: Lithium-ion batteries are promising candidates for high-energy-density rechargeable batteries due to their low electrode potentials and high theoretical capacities [1], [2]. However, during the cycle, dendrites forming on

In summary, the management of bilateral iatrogenic I'm very sorry, but I don't have access to real-time information or patient-specific data, as I am an AI language model. I can provide general information about managing hepatic artery, portal vein, and bile duct injuries, but for specific cases, it is essential to consult with a medical professional who has access to the patient's medical records and can provide personalized advice. It is



# Asking AI to Generate Your Science Paper:

[Link](#)



Raneem Bader MD <sup>a</sup>, Ashraf Imam MD <sup>b</sup>, Mohammad Alnees MD <sup>a, c</sup> ✉, Neta Adler MD <sup>c</sup>,  
Joanthan ilia MD <sup>c</sup>, Dina Zugayar MD <sup>b</sup>, Arbell Dan MD <sup>d</sup>, Abed Khalaileh MD <sup>b</sup> ✉

Show more ▾

+ Add to Mendeley 🔗 Share 📄 Cite

<https://doi.org/10.1016/j.radcr.2024.02.037>

Under a Creative Commons license 🔗

open access

Referred to by **Removal notice to “Successful management of an iatrogenic portal vein and hepatic artery injury in a 4-month-old female patient: A case report...”**  
Radiology Case Reports, Volume 19, Issue 8, August 2024, Pages 3598  
Raneem Bader, Ashraf Imam, Mohammad Alnees, Neta Adler, Joanthan ilia, Dina Zugayar, Arbell Dan, Abed Khalaileh

View PDF

This article has been removed: please see Elsevier Policy on Article Withdrawal (<https://www.elsevier.com/about/policies/article-withdrawal>).

This article has been removed at the request of the Editors-in-Chief and the authors because informed patient consent was not obtained by the authors in accordance with journal policy prior to publication. The authors sincerely apologize for this oversight.

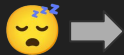
In addition, the authors have used a generative AI source in the writing process of the paper without disclosure, which, although not being the reason for the article removal, is a breach of journal policy. The journal regrets that this issue was not detected during the manuscript screening and evaluation process and apologies are offered to readers of the journal.

“Confronting the demonization of AI writing: Reevaluating its role in upholding scientific integrity,”

by Luca Fiorillo ChatGPT [Link](#)

## Abstract

The advent of AI-assisted writing tools, such as ChatGPT, has generated significant debate within scientific communities, primarily regarding their influence on the rigor and integrity of academic writing. While critics argue that reliance on these tools could dilute analytical depth or introduce biases, a balanced perspective suggests that AI-driven writing can enhance clarity, structure complex arguments, and improve the efficiency of scientific communication. This manuscript addresses the controversies surrounding AI writing by analyzing historical precedents of methodological errors in published research, highlighting the need for error-minimizing tools during manuscript preparation. Case studies of notable retractions and methodological critiques reveal that inaccuracies in scientific literature are not unique to the era of AI. These issues underscore the need for stringent ethical practices and critical evaluation, regardless of technological advancements. AI writing tools, when employed responsibly, serve as valuable assets to researchers by supporting precision and transparency in scholarly communication. Thus, embracing AI tools, rather than demonizing them, may contribute positively to the goals of reproducibility and trustworthiness in academic publications. Ethical guidelines and a commitment to integrity remain paramount as these tools evolve.



# What about Texts?

## Social Media? Emails? Speeches?

<storytime>

AI has a recognizable writing voice.

Do you?

Therefore,	Thus,	Yet,	So,
Imagine/you	akin	vital	tapestry
impact	production	such as	delve
vast	interplay	fundamental	processes

Thoroughly conscious ignorance is the prelude to every real advance in science.

*J. Clerk Maxwell*

# SUBATOMIC WRITING

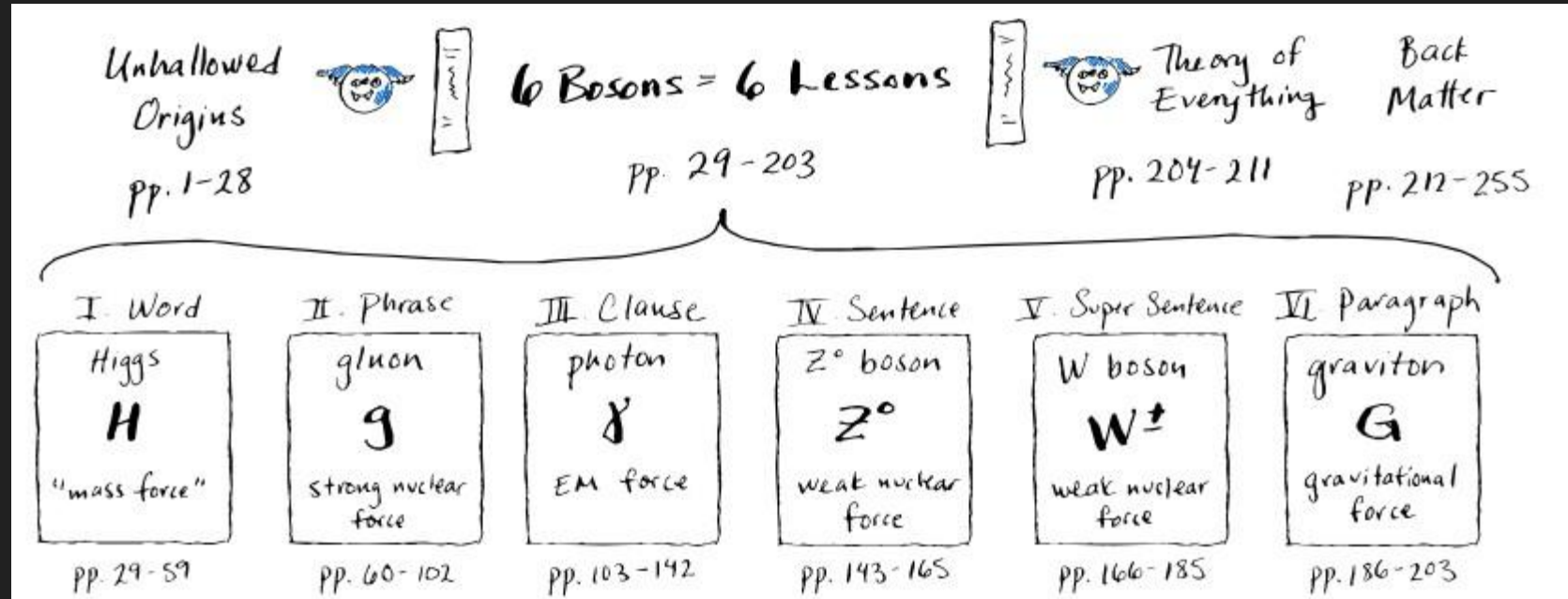


# The Writing Process

- Dirty first draft
- Second/third draft: Solid, accurate information, keep track of references
- Go Subatomic
  - Lesson I. Good Vibrations: Word level (Skills: Sound & Sense)
  - Lesson II. Nested Classes: Phrase level (Skill: Word Class)
  - Lesson III. Visual Syntax: Clause level (Skills: Grammar & Syntax)
  - Lesson IV. Mind's Breath: Sentence level (Skill: Punctuation)
  - Lesson V. Repetition, Variation: Super-Sentence level (Skills: Rhythm & Emphasis)
  - Lesson VI. Dot-to-Dot Game: Paragraph level (Skills: Pacing & Coherence)
- Submit . . . Resubmit . . . Resubmit . . . Rethink . . . Revise . . . Resubmit
- Edit (Be nice to your editor!)
- Publish
- Bonus points if you then write an article about it for a lay audience



# Mapping Standard English to the Standard Model



See *Subatomic Writing*, Table 0.3, p. 25

# 6 Leptons = 6 Typographical Conventions

## LESSON IV

capitalization,  
superscripts,  
etc.  
↑

Pause,  
Link, →  
and  
Tighten

Space  
between →

electron $e^-$ punctuation	muon $\mu^-$ individual emphasis	tau $\tau^-$ whole-word emphasis
electron neutrino $\nu_e$ words	muon neutrino $\nu_\mu$ sentences	tau neutrino $\nu_\tau$ paragraphs

↑  
italics  
**bold**  
"quotations"  
underlined

See *Subatomic Writing*, Table 0.2, p. 24

# 6 Quarks = 6 Kinds of Words

"Lexical" = BRIGHT

"Function" = boring

Up <b>u</b> Common Lexical words	Charm <b>c</b> Complex Lexical words	Top <b>t</b> <del>Inter words</del>
Down <b>d</b> Common Function words	Strange <b>s</b> Complex Function words	Bottom <b>b</b> <del>Confusing words</del>
1st	2nd	3rd

Good for  
fictional  
dialogue,  
bad for  
formal  
writing

pretentious

See Table 1.1,  
p. 34

Generation

↑  
short  
old  
concrete  
Anglo-Saxon

Generation

↑  
Simplify  
when possible,  
spell out & define  
on 1st use if not possible

Generation

# Origins of English

## Latinate

Accelerate

Cognizant

Observe

Amplitude

Analysis

Construct

Application

Terminate

Ascend

Associate

Calculate

## Germanic:

Speed up

Aware

See

Height

Study

Build

Use

End

Go up

Link

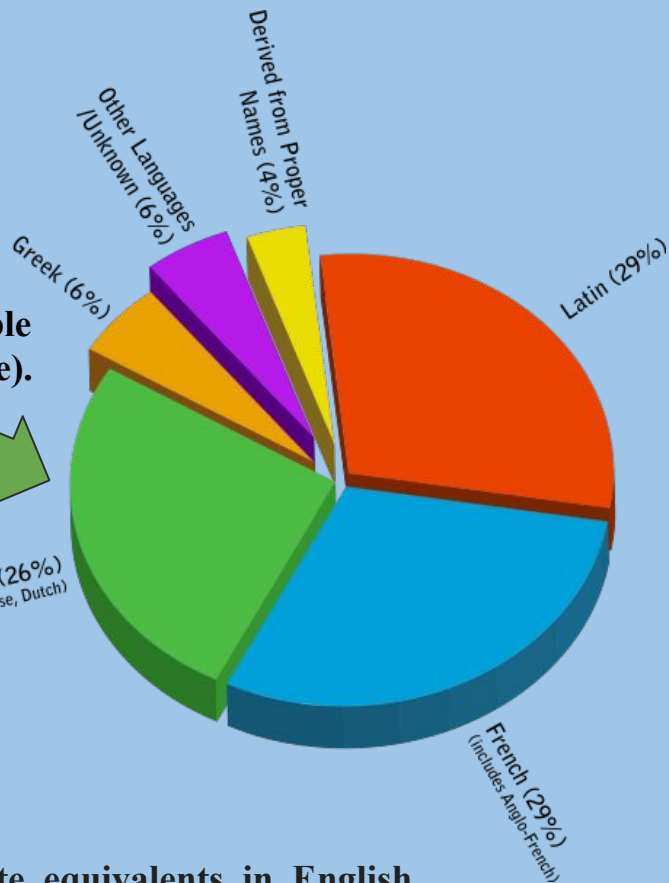
Reckon



♥️ of the English language. Use these words whenever possible (it's not always possible).



Germanic Languages (26%)  
(Old/Middle English, Old Norse, Dutch)



[https://en.wikipedia.org/wiki/List\\_of\\_Germanic\\_and\\_Latinate\\_equivalents\\_in\\_English](https://en.wikipedia.org/wiki/List_of_Germanic_and_Latinate_equivalents_in_English)

Learn to recognize these! Melba can help you learn to identify word classes. *Subatomic Writing*, p. 34

Be careful! The same word can switch word classes.  
From pp. 63–64:

**Noun:** The *well* of words runs deep.

**Verb:** Tears *well* up in students' eyes during Lesson II.

**Adjective:** All will be *well* by the end.

**Adverb:** Are things going *well*?

**Interjection** (Insert Word): *Well*, fine then.

TABLE 1.1

Word families: Lexical words, Function words, and Insert words. Just as **Up** and **Down** quarks are the most common type of quark in common matter, **Lexical** and **Function** words are the most common words in writing. And just as **Top** quarks do not combine with other quarks, **Insert** words do not grammatically combine with other words in a sentence.

QUARK	SYMBOL	:	WORD FAMILY (WORD CLASSES)	WORD CLASS ABBR.
<b>Up</b>	u	:	<b>Lexical words ("brick words")</b> ☀️ noun ( <i>cat, boy, library, book, physics</i> ) verb ( <i>purr, laugh, sit, read, work on</i> ) adjective ( <i>soft, funny, cozy, odd, essential</i> ) adverb ( <i>here, today, usually, very, soon</i> )	n v adj adv
<b>Down</b>	d	:	<b>Function words ("mortar words")</b> ☁️ determiner ( <i>a, the, this, that, my, your, her, every, some, seven, etc.</i> ) pronoun ( <i>you, it, theirs, this, those, myself, each other, who, what, etc.</i> ) primary auxiliary verb ( <i>be, do, have</i> ) modal auxiliary verb ( <i>can, could, shall, should, will, would, may, might, must; sometimes ought, dare, need, and had better</i> ) preposition ( <i>in, out, on, off, of, toward, etc.</i> ) coordinating conjunction (FANBOYS: <i>for, and, nor, but, or, yet, so</i> ) subordinating conjunction ( <i>because, while, although, if, than, that, etc.</i> )	det pron p.aux m.aux prep cc sc



The diagram illustrates the syntactic structure of the sentence "Ignorance is prelude to advance in science." It uses a coordinate system with a vertical axis on the left and a horizontal "valency" axis at the top. The sentence is broken down into hierarchical phrases:

- Independent Clause** (top level, indicated by a wavy line)
- NP** (Noun Phrase) containing "ignorance" (marked with a sun icon).
- VP** (Verb Phrase) containing "is" (marked with a sun icon).
- SP** (Subject Phrase) containing "prelude" (marked with a sun icon).
- OP** (Object Phrase) containing "advance" (marked with a sun icon).
- PP** (Prepositional Phrase) containing "in science." (marked with a sun icon).
- AdjP** (Adjective Phrase) containing "consciously" (marked with a sun icon) and "thoroughly" (marked with a sun icon).
- NP** (Noun Phrase) containing "the" (marked with a cloud icon) and "to" (marked with a cloud icon).
- PP** (Prepositional Phrase) containing "every" (marked with a cloud icon) and "real" (marked with a sun icon).

The diagram also shows various grammatical markers and groupings, such as "n" for noun, "v" for verb, "art" for article, "prep" for preposition, "det" for determiner, and "adj" for adjective. The "valency" axis is marked with a wavy line and an arrow pointing to the right.

J. Clerk Maxwell

Learn to recognize words grouped into these 10 kinds of phrases. Then learn to see how phrases are nested in other kinds of phrases (recursion).

*Subatomic Writing, p. 93*

TABLE 2.2

**Gluon states** and their corresponding English phrases, including composite colors (shown in the column labeled “A More Colorful Name”). The bold head words under “Organization” are essential to building the phrase; the rest are optional additions in the phrase.

GLUON	A MORE COLORFUL NAME	ENGLISH PHRASE	ABBR.	ORGANIZATION
Red/ AntiBlue	<b>Flush Orange</b>	Noun Phrase	NP	<b>head noun</b> + modifiers (mod) <i>the blue <b>demon</b></i>
Blue/ AntiGreen	<b>Electric Purple</b>	Verb Phrase	VP	<b>main verb</b> + aux + mod <i>will have been <b>trying</b></i>
Green/ AntiRed	<b>Spring Green</b>	Adjective Phrase	AdjP	<b>head adj</b> + mod <i><b>faster</b> than I could blink</i>
Red/ AntiGreen	<b>Deep Pink</b>	Adverbial Phrase	AdvP	<b>head adv</b> + mod <i>far too <b>late</b></i>
Blue/ AntiRed	<b>Dodger Blue</b>	Prepositional Phrase	PP	<b>prep</b> + mod + <b>object of the preposition (OP)</b> + mod <i>in the <b>library</b> downstairs</i>
Green/ AntiBlue	<b>Bright Lime</b>	Participial Phrase	PartP	<b>participle (part)</b> + NP + mod <i><b>watching</b> me with one eye</i>
		Infinitive Phrase	InfP	<b>infinitive (inf)</b> + NP + mod <i><b>to read</b> books in the library</i>
		Gerund Phrase	GP	<b>gerund (ger)</b> + NP + mod <i><b>waking</b> me up</i>
Brown/ AntiBrown	<b>Mocha Brown</b>	Appositive Phrase	App	<b>NP, rename NP</b> , <i><b>Dyna</b>, my worst <b>nightmare</b>,</i>
Gray/ AntiGray	<b>Gravel Gray</b>	Absolute Phrase	Abs	<b>NP + PartP</b> <i><b>weather permitting</b></i>

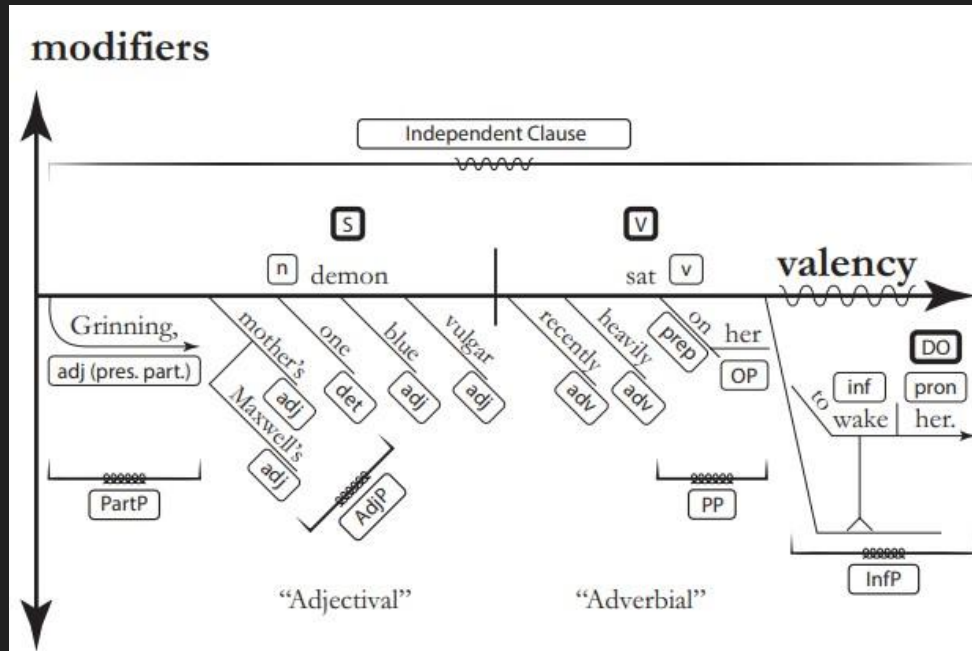


FIGURE A.3 Various types of modifiers in a Subatomic Writing diagram. This sentence has a valency pattern of Subject + Verb (S + V), with a host of (excessive) modifiers: *Grinning, Maxwell's mother's one blue vulgar demon recently sat heavily on her to wake her.*

Source: Jamie Zvirzdin.

Learn to distinguish the ❤️ of a sentence (its valency pattern) from extraneous modifiers. *Subatomic Writing*, p. 228

TABLE 2.1  
A handy-dandy verb chart.

ASPECT AND/OR VOICE	PRESENT TENSE	PAST TENSE	MODALITY
<b>simple</b>	writes, write	wrote	could write
<b>progressive</b>	am/is/are writing	was/were writing	could be writing
<b>perfect</b>	has/have written	had written	could have written
<b>passive</b>	am/is/are written	was/were written	could be written
<b>perfect + progressive</b>	has/have been writing	had been writing	could have been writing
<b>perfect + passive</b>	has/have been written	had been written	could have been written
<b>progressive + passive</b>	am/is/are being written	was/were being written	could be being written

Note: The more verbs and verb forms you know, the stronger your writing game can be.

The most important part of a sentence is its verb.  
*Subatomic Writing*, p. 74

The 8 valency patterns of the  
English language.

*Subatomic Writing*, p. 115

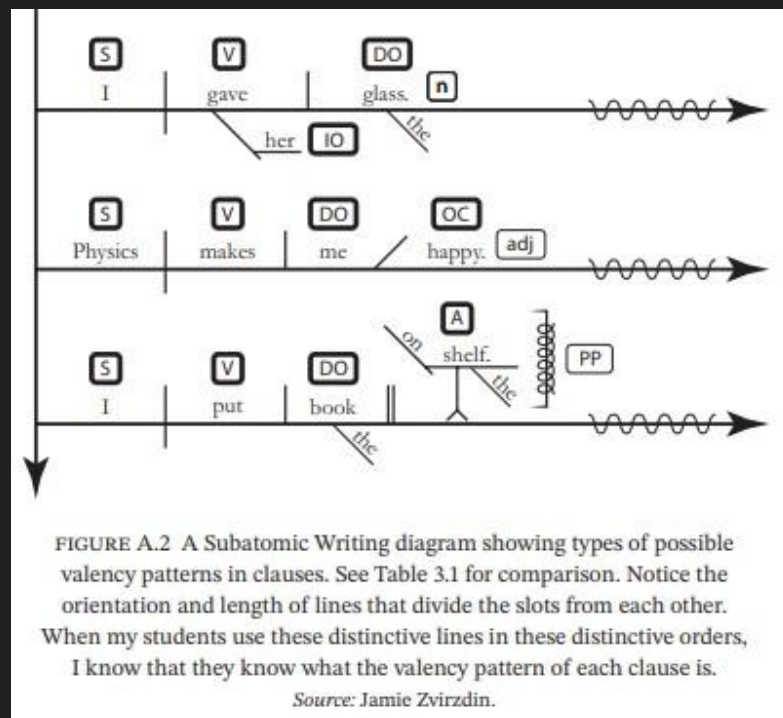
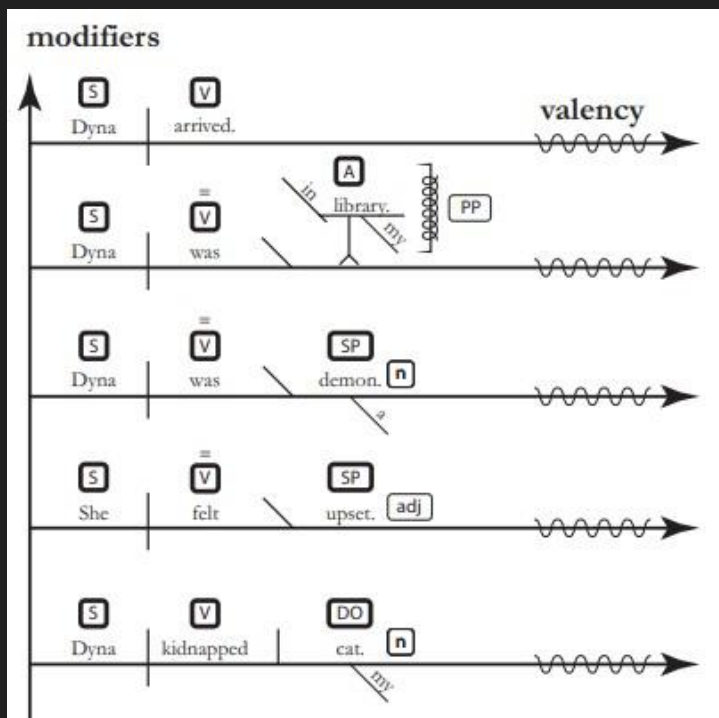
Humans often overuse S V SP,  
and ChatGPT overuses S V DO.

TABLE 3.1

Major **valency patterns** of English syntax, matched up with the simplest nuclei in the universe. Minus the fragment, each of these patterns creates one independent clause.

ELEMENT	NUCLEUS	:	VALENCY PATTERN	ABBR.
<b>Hydrogen</b> H	p	:	Subject (fragment: <i>The blue demon.</i> )	S
<b>Deuterium</b> <sup>2</sup> H	p n	:	Subject + Verb (intransitive: <i>Dyna arrived.</i> )	S V
<b>Tritium</b> <sup>3</sup> H	p n n	:	Subject + Copular Verb + Obligatory Adverbial (less common copular: <i>Dyna was in my library.</i> )	S V A
<b>Helium-3</b> <sup>3</sup> He	p n p	:	Subject + Copular Verb + Subject Predicate (copular: <i>Dyna was a demon. She felt upset.</i> )	S V SP
		:	Subject + Verb + Direct Object (monotransitive: <i>Dyna nabbed my cat.</i> )	S V DO
<b>Helium-4</b> <sup>4</sup> He	p n p n	:	Subj. + Verb + Indirect Object + Direct Object (ditransitive: <i>I gave her the glass.</i> )	S V IO DO
		:	Subj. + Verb + Direct Obj. + Obj. Complement (complex transitive: <i>She called herself Dyna. Physics makes me happy.</i> )	S V DO OC
		:	Subj. + Verb + Direct Obj. + Oblig. Adverbial (complex transitive: <i>I put the book on the shelf.</i> )	S V DO A





Core valency patterns of the English language,  
diagrammed. *Subatomic Writing*, p. 227

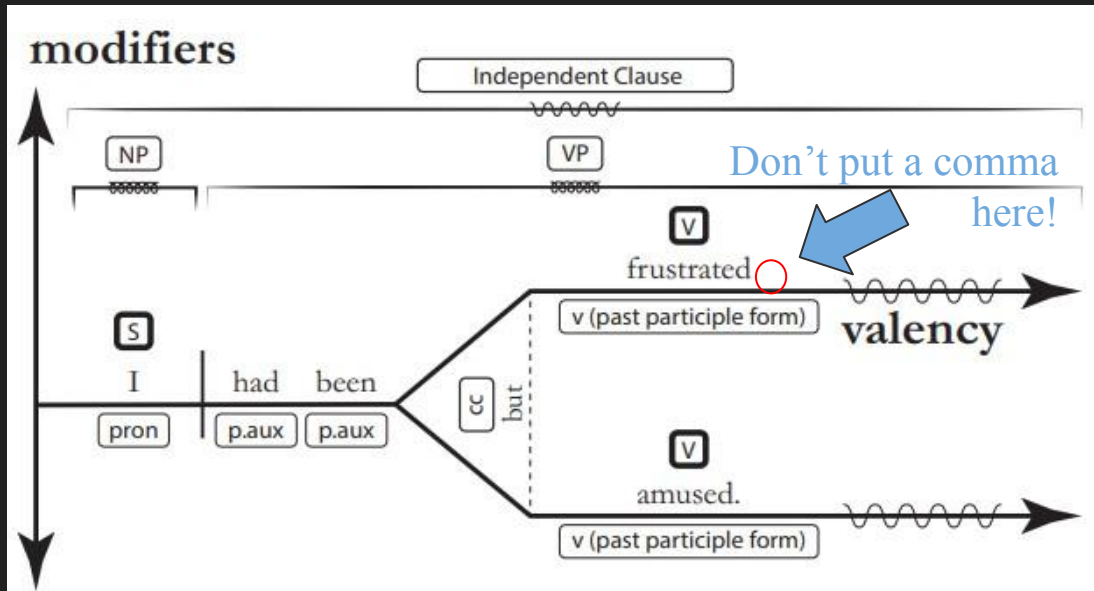


FIGURE A.4 An example of a compound predicate sentence: *I had been frustrated but amused.* The Subject applies to both Verbs. Notice that no comma comes after *frustrated*. While Figure A.4 was written with passive-voice verbs (past tense, perfect aspect), Figure A.5 was rewritten with active-voice verbs (still past tense, perfect aspect).

Source: Jamie Zvirzdin.

Knowing word class, phrases, and valency patterns then helps you with punctuation (Lesson IV).

*Subatomic Writing*, p. 229

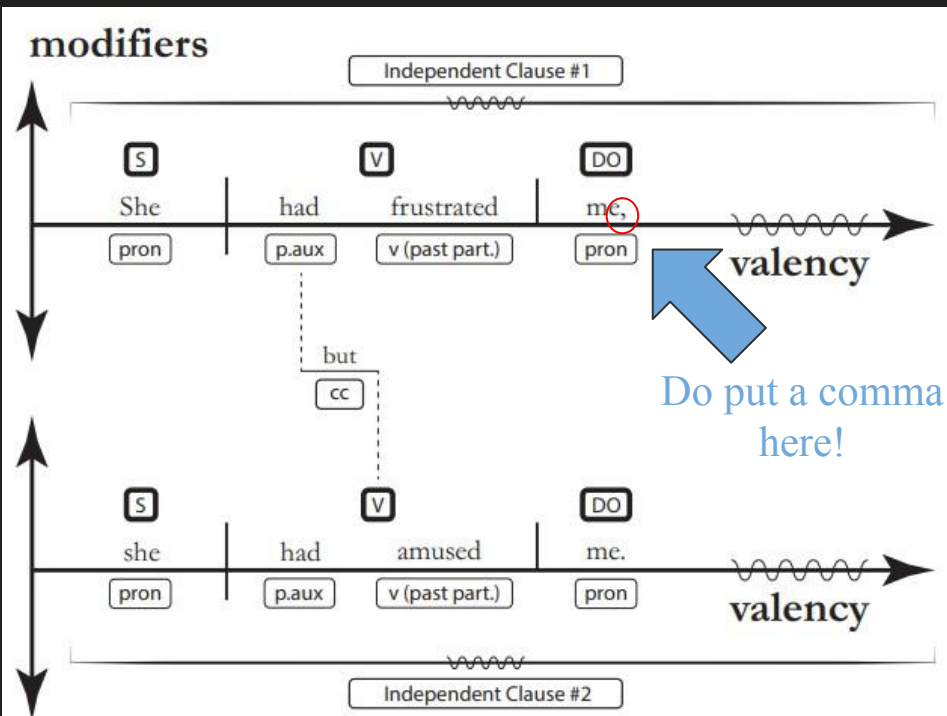


FIGURE A.5 An example of a compound sentence: *She had frustrated me, but she had amused me.* This sentence contains two independent clauses, on their own valency axis, and they are linked by one of the seven coordinating conjunctions (FANBOYS: *for, and, nor, but, or, yet, so*). Unless the first independent clause is extremely short, we always put a comma before the coordinating conjunction (in this case, after the first direct object, *me*).

Source: Jamie Zvirzdin.

Once you can identify Subjects (S) and Verbs (V), you can identify your own punctuation errors more easily and quickly.

See *Subatomic Writing*, Table 4.1, pp. 158–165

Common Errors (per <i>Chicago</i> )	Numerous!
no period (it happens to the best of us)	S V Fix: S V.
comma placed between subject and verb	S, V. Fix: S V.
comma placed between verb and direct object	S V, DO. Fix: S V DO.
second comma missing around an Appositive Phrase	S, App V. Fix: S, App, V.
serial comma missing before coordinating conjunction in a series	S, S cc S V. Fix: S, S, cc S V.
run-on sentence	S V S V. Fix: S V. S V. Or: S V; S V. Or: S V, cc S V.

(Continued)

TABLE 5.1

Simple scansion: The most common rhythms in speech and poetry.

NAME OF FOOT	NAME OF METER	SYMBOLS	EXAMPLE
<b>Iamb</b>	Iambic	. —	<i>the sun around</i>
<b>Anapest</b>	Anapestic	.. —	<i>by the lab intervene</i>
<b>Trochee</b>	Trochaic	— .	<i>went to enter</i>
<b>Dactyl</b>	Dactylic	— ..	<i>color of nucleus</i>
<b>Pyrrhic</b>	Pyrrhic	..	<i>of a</i>
<b>Spondee</b>	Spondaic	— —	<i>true blue</i>
<b>Monosyllable</b>	Monosyllabic	—	<i>truth</i>

*It is a slightly arresting notion  
that if you were to pick yourself apart  
with tweezers, one atom at a time,  
you would produce a mound of fine atomic dust,  
none of which had ever been alive  
but all of which had once been you.*

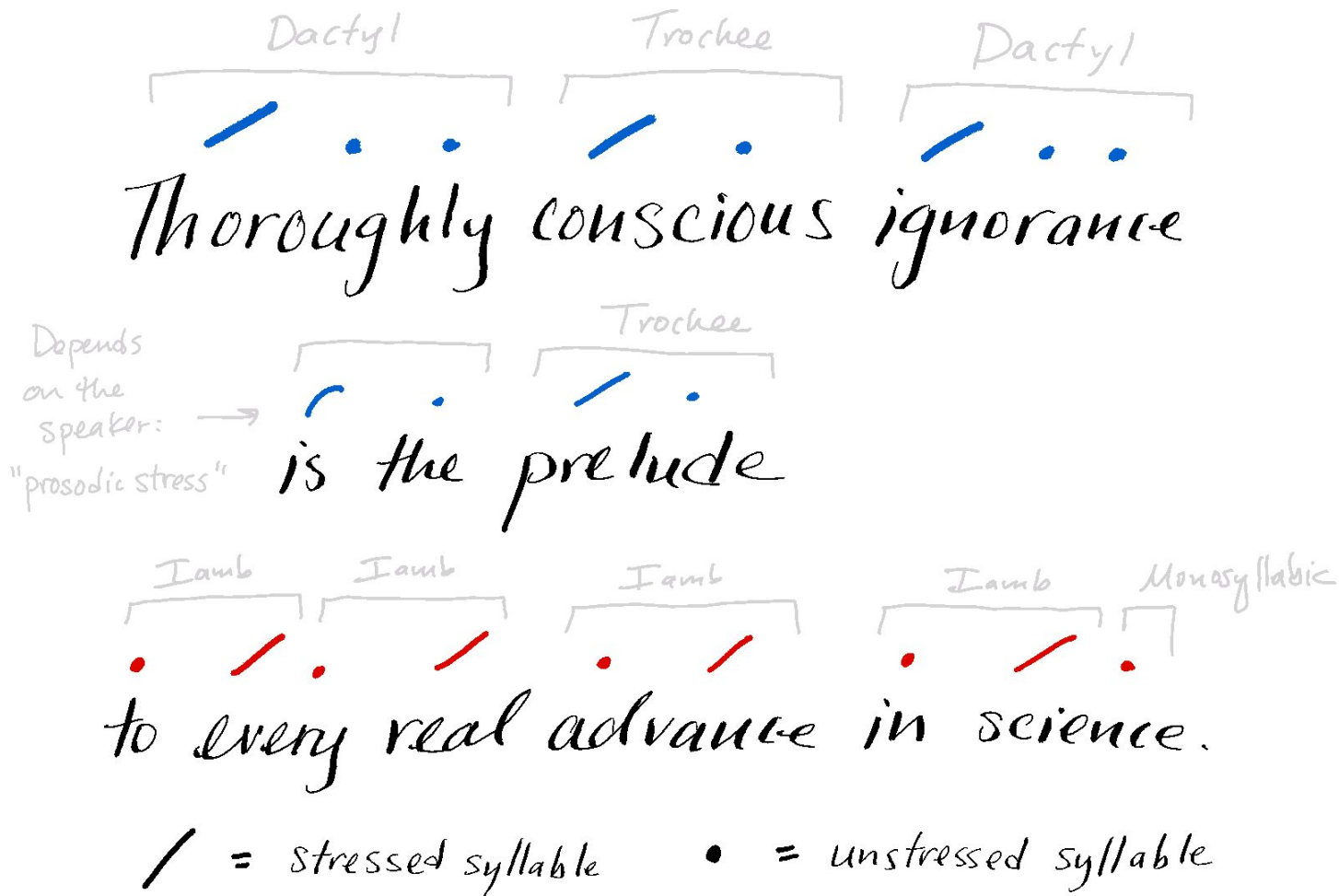
Lesson V: A “Super-Sentence” has a discernible (but not perfect) poetic rhythm. Use at the beginning and end of papers and paragraphs.

Even when we read silently, our brains still “hear” the sentence!

*See Subatomic Writing,  
pp. 171–172*



# What Does Your Sentence Sound Like?



## Paragraph Coherence, (Lesson VI)

Important to connect  
the dots, but don't  
overdo it!

*Subatomic Writing,*  
p. 194

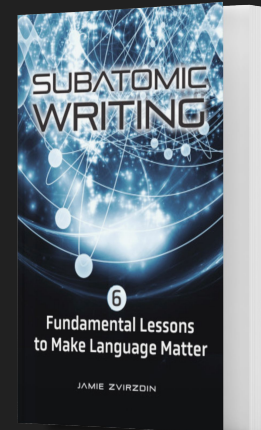
1. **Similarity:** *and, similarly, likewise, too*
2. **Contrast:** *but, in contrast, on the other hand, alternatively*
3. **Elaboration:** *(colon), that is, in other words, which is to say, also, furthermore, in addition, notice that, which*
4. **Exemplification:** *for example, for instance, such as, including*
5. **Generalization:** *in general, more generally*
6. **Exception (generalization first):** *however, on the other hand, then there is*
7. **Exception (exception first):** *nonetheless, nevertheless, still*
8. **Sequence (before-and-after):** *and, before, then*
9. **Sequence (after-and-before):** *after, once, while, when*
10. **Result (cause-effect):** *and, as a result, therefore, so*
11. **Explanation (effect-cause):** *because, since, owing to*
12. **Violated expectation (preventer-effect):** *but, while, however, nonetheless, yet*
13. **Failed prevention (effect-preventer):** *despite, even though*
14. **Attribution:** *according to, stated that*
15. **Other, e.g., anticipation of a reader's reaction:** *yes, I know*

~~Thus,~~

~~So,~~

# Review: How to Improve Your Science Writing at Fundamental Levels

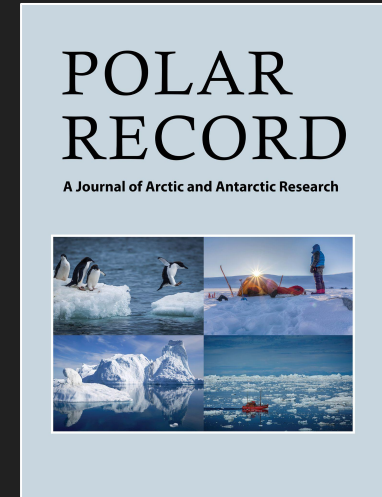
- I. Does each word matter? Does my sentence balance Germanic and Latin/French/Greek etymologies?
- II. Do I have too many nested phrases?  
Are my PIGs muddying the message? (PIGs are Participles, Infinitives, and Gerunds)
- III. Does my sentence have a strong heart, a strong valency pattern?
- IV. If I read this sentence out loud, do I run out of breath?
- V. Do important sentences have a discernible rhythm?
- VI. Do I leave a bread-crumble trail of logic for my reader to follow through the paragraph?



# Editing



William Muntean,  
“One Century of U.S. Policy  
Toward Antarctica”



# Editing

Day of the month	Check-in time	Check-out time	Break hours	Total hours	Progress
11	11:00 AM	5:00 PM	1	5.00	Started style sheet, added APA-style page numbers and header title, added title page and author note sections, created and applied Styles in Word per APA specifications (title, subtitle, author note, abstract, level-2 headings, reference title, hanging indent references, indented body text, body text with no indent, etc., double-spaced in Times New Roman 12pt font), conducted preliminary global find/replace editing (replaced hyphens with needed en dashes in numbered ranges, deleted extra spaces between words, sentences, and paragraphs, fixed em dashes), and fixed ellipses. (This is the hardest part!)
15	10:20 AM	3:40 PM	1.17	4.17	Edited pages 2 to 22; updated style sheet. Needed to regularize acronyms.
16	7:40 AM	2:19 PM	1.42	5.23	Edited pages 2 to 38; updated style sheet. Needed to rewrite some sentences for clarity and issues with parallel structure and/or ambiguity.
17	4:00 PM	1:30 AM	4.83	4.67	Edited pages 38 to 60. References needed lots of changes. Emailed all documents.

## Tools of the Trade:

- Timesheet
- Style sheet
- APA style ([Purdue OWL](#); [APA Templates](#) and [Guides](#)) (Read through guide!)
- Merriam-Webster: [www.m-w.com](http://www.m-w.com) (Look things up!)
- Track Changes and Comments in Microsoft Word (also LaTeX)
- *The most energy-efficient neural network in the world!*



# Thank you!





## THE HARD STUFF

Avoid “that” wherever possible. It’s an ugly, overused word. You can often drop it.

The hag **that** had nabbed my cat added **that** it’s not **that** bad and **that that**’s the only way **that** I will get **that** cat back.

Revision: The hag who nabbed my cat said  
it’s not **that** bad and it’s the only way  
I’ll get my cat back.

*Subatomic Writing*, pp. 223–225

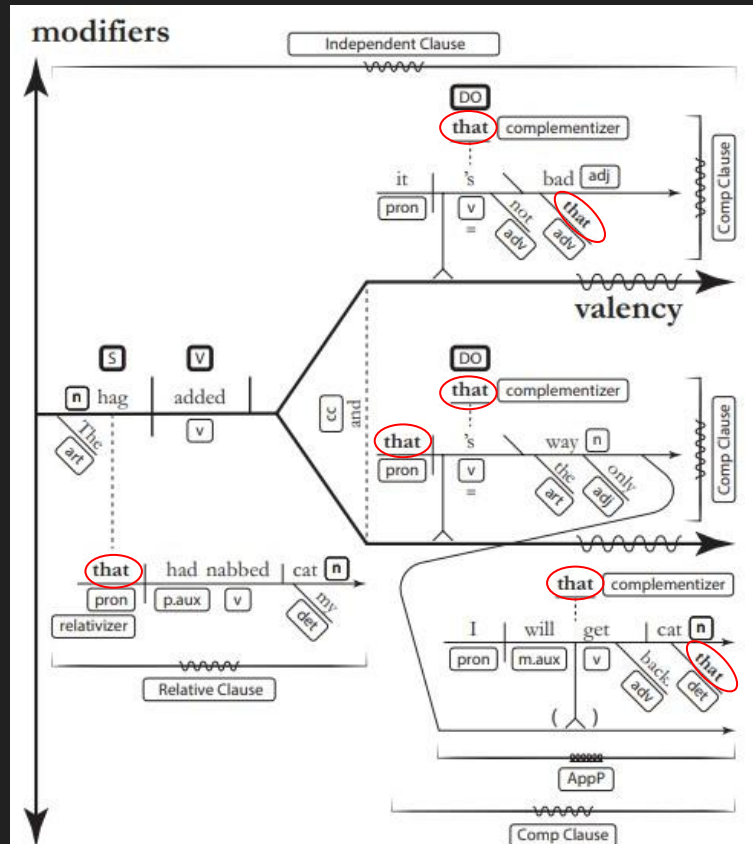


FIGURE A.1 A horrible sentence unraveled in a Subatomic Writing diagram and labeled by word class, clause, and valency pattern. *The hag that had nabbed my cat added that it's not that bad and that that's the only way that I will get that cat back.*

Source: Jamie Zvirzdin.

**P**articiples  
**I**nfinitives  
**G**erunds

The diagram illustrates the syntactic structure of the sentence "Tom tried to understand what was causing the banging and yelling coming from below." The structure is organized into a tree with various grammatical components labeled.

**Main Clause:**

- S (Subject):** Tom (n)
- V (Verb):** tried (v)
- DO (Direct Object):** to understand (inf)

**Infinitive Phrase (to understand):**

- S (Subject):** what (pron)
- V (Verb):** was (p.aux), causing (v)
- DO (Direct Object):** the banging and yelling coming from below.

**Noun Phrase (what was causing...):**

- S (Subject):** what (pron)
- V (Verb):** was (p.aux), causing (v)
- DO (Direct Object):** the (art), banging (gerund), and (conj), yelling (gerund), coming (adj. pres. part.), from (prep), below. (pp)

**Participial Phrase (banging and yelling coming from below):**

- S (Subject):** the (art), banging (gerund), and (conj), yelling (gerund), coming (adj. pres. part.)
- V (Verb):** from (prep), below. (pp)
- DO (Direct Object):** (empty)

**Modifiers and Valency:**

- Modifiers:** Baffled, (adj. past. part.)
- Valency:** The diagram shows the valency of the main clause (Tom tried) and the infinitive phrase (to understand).

**Arrows:**

- A green arrow points to the main clause.
- A pink arrow points to the infinitive phrase.
- A blue arrow points to the noun phrase.
- A red arrow points to the participial phrase.

Source: Jamie Zvirzdin.