







34% of Americans think the impact of science on society is equally positive and negative



# A crowded PhD market

### Research doctorate recipients from U.S. colleges and universities: 1958-2022

(Number and percent)

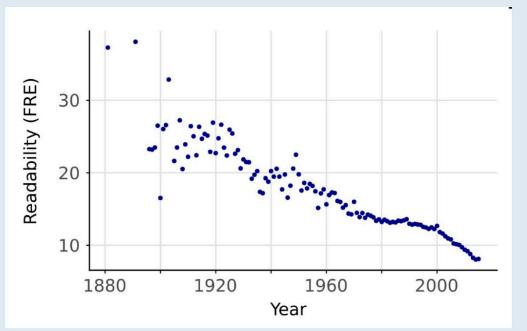
Year	Doctorate recipients	% change from previous year
2009	49,552	1.6
2010	48,028	-3.1
2011	48,909	1.8
2012	50,943	4.2
2013	52,703	3.5
2014	53,986	2.4
2015	54,886	1.7
2016	54,809	-0.1
2017	54,552	-0.5
2018	55,078	1.0
2019	55,609	1.0
2020	55,208	-0.7
2021	52,194	-5.5
2022	57,596	10.3

<sup>\*</sup> = value between -0.05% and 0.05% and not equal to 0.0%.

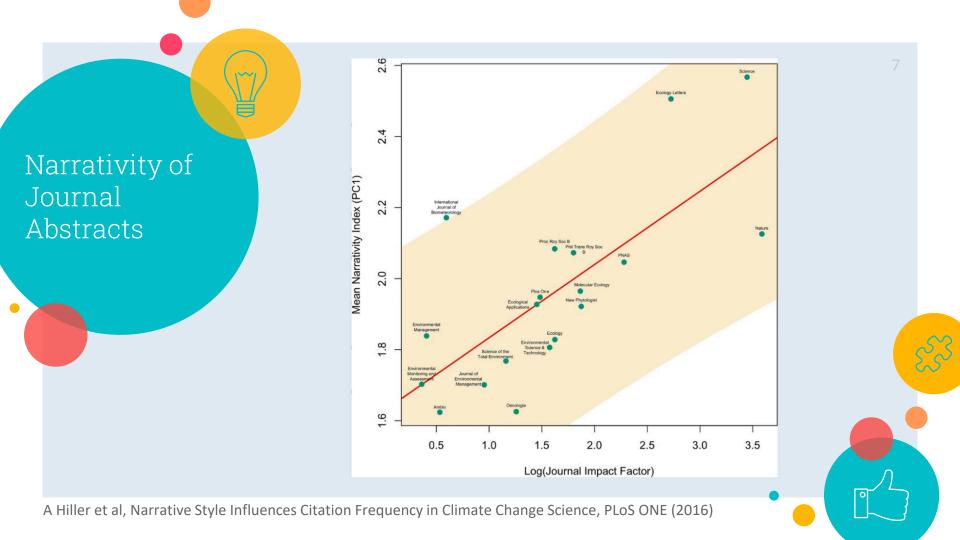




Readability of Scientific Journal Articles









National Survey of Employers Priorities

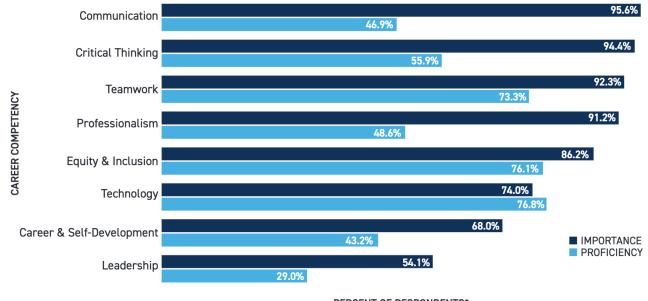
#1: Communication
with persons inside and
outside the organization







# FIGURE 46: IMPORTANCE VS. PROFICIENCY ON CAREER READINESS COMPETENCIES, BY PERCENT OF RESPONDENTS



#### PERCENT OF RESPONDENTS\*

<sup>\*</sup>The percentages corresponding to "importance" represent, among all responding employers, the percentage that, on a five-point scale, indicated that the respective competency was either "very important" (4) or "extremely important" (5) for college graduates to have to enter their workforce. The percentages corresponding to "proficiency" represent, among all responding employers, the percentage that, on a five-point scale, rated recent graduates either "very" (4) or "extremely" (5) proficient in the respective competency.







#### The Science of Scientific Writing

If the reader is to grasp what the writer means, the writer must understand what the reader needs George D. Gopen, Judith A. Swan

This article was originally published in the November-December 1990 issue of American Scientist.

Science is often hard to read. Most people assume that its difficulties are born out of necessity, out of the extreme complexity of scientific concepts, data and analysis. We argue here that complexity of thought need not lead to impenetrability of expression; we demonstrate a number of rhetorical principles that can produce clarity in communication without oversimplifying scientific issues. The results are substantive, not merely cosmetic: Improving the quality of writing actually improves the quality of thought.

The fundamental purpose of scientific discourse is not the mere presentation of information and thought, but rather its actual communication. It does not matter how pleased an author might be to have converted all the right data into sentences and paragraphs; it matters only whether a large majority of the reading audience accurately perceives what the author had in mind. Therefore, in order to understand betwo writing, we would do well to understand between how readers go about reading. Such an understanding has recently become available through work done in the fields of rhetoric, linguistics and cognitive psychology. It has helped to produce a methodology based on the concept of reader expectations.

#### Writing with the Reader in Mind: Expectation and Context

Readers do not simply read; they interprete, Any piace of prose, no matter how short, may "mean" in 10 (or more) different ways to 10 different readers. This methodology of reader expectations is founded on the recognition that readers make many of their most important interpretive decisions about the substance of prose based on clues they receive from its structure.

This interplay between substance and structure can be demonstrated by something as basic as a simple table. Let us say that in tracklight be temperature of a loud over a proof of time, an investigator take measurements every three minutes and records a list of temperatures. Those data could be presented by a number of winther structures. Here are two ossessions.

t(time)=15',  $T(temperature)=32^\circ$ , t=0',  $T=25^\circ$ ; t=6',  $T=29^\circ$ ; t=3',  $T=27^\circ$ ; t=12',  $T=32^\circ$ ; t=9';  $T=31^\circ$ 

#### time (min) temperature(°C)

0	25
3	27
6	29
9	31
12	32





The smallest of the URF's (URFA6L), a 207-nucleotide (nt) reading frame overlapping out of phase the NH<sub>2</sub>-terminal portion of the adenosinetriphosphatase (ATPase) subunit 6 gene has been identified as the animal equivalent of the recently discovered yeast H<sup>+</sup>-ATPase subunit 8 gene. The functional significance of the other URF's has been, on the contrary, elusive. Recently, however, immunoprecipitation experiments with antibodies to purified, rotenone-sensitive NADH-ubiquinone oxido-reductase [hereafter referred to as respiratory chain] NADH dehydrogenase or complex I] from bovine heart, as well as enzyme fractionation studies, have indicated that six human URF's (that is, URF1, URF2, URF3, URF4, URF4L, and URF5, hereafter referred to as ND1, ND2, ND3, ND4, ND4L, and ND5) encode subunits of complex I. This is a large complex that also contains many subunits synthesized in the cytoplasm.



The smallest of the URF's, and [A], has been identified as a [B] subunit 8 gene. The functional significance of the other URF's has been, on the contrary, elusive. Recently, however, [C] experiments, as well as [D] studies, have indicated that six human URF's [1-6] encode subunits of Complex I. This is a large complex that also contains many subunits synthesized in the cytoplasm.







## **Subject-Verb Separation**

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## **Stress-Position**

Don't attempt to emphasize more than one important piece of information in a sentence. And highlight that information by placing it at the beginning or end of a sentence.







## **Stress-Position**

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Recently, however, several human URF's have been shown to encode subunits of rotenonesensitive NADH-ubiquinone oxido-reductase. This is a large complex that also contains many subunits synthesized in the cytoplasm; it will be referred to hereafter as respiratory chain NADH dehydrogenase or complex I. Six subunits of Complex I were shown by enzyme fractionation studies and immunoprecipitation experiments to be encoded by six human URF's (URF1, URF2, URF3, URF4, URF4L, and URF5); these URF's will be referred to subsequently as ND1, ND2, ND3, ND4, ND4L and ND5.



Calcium blockers can control muscle spasms. Sarcomeres are the small units of muscle fibers in which these drugs work. Two filaments, one thick and one thin, are in each sarcomere. The proteins actin and myosin are contained in thin filament. When actin and myosin interact, your heart contracts.

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Put old information at the beginning of sentences, new information at the end.



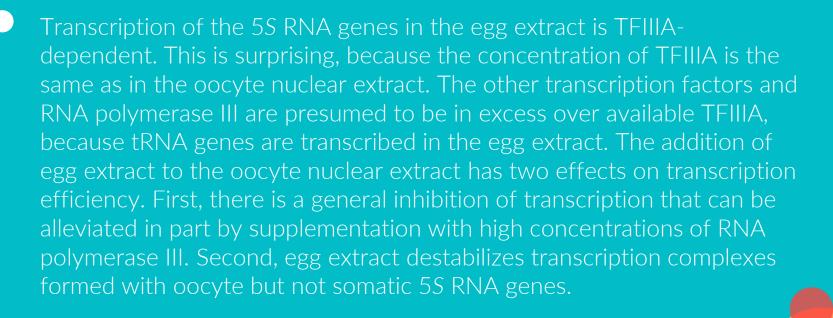
### **Stress-Position**

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Muscle spasms can be controlled with drugs known as calcium blockers.

Calcium blockers work in small units of muscle fibers called sarcomeres.

Each sarcomere has two filaments, one thick and one thin. The thin filament contains two proteins, actin and myosin. When actin and myosin interact, your heart contracts.





## **Focus**

Make a single topic the focus of a paragraph whenever possible. Use the stress positions to emphasize that establish that focus.





# **Verbs**

Use strong verbs that indicate the action that you aim to express.



## **Focus & Verb Position**

Transcription of the 5S RNA genes in the egg extract is TFIIIA-dependent. This is surprising, because the concentration of TFIIIA is the same as in the oocyte nuclear extract. The other transcription factors and RNA polymerase III are presumed to be in excess over available TFIIIA, because tRNA genes are transcribed in the egg extract. The addition of egg extract to the oocyte nuclear extract has two effects on transcription efficiency. First, there is a general inhibition of transcription that can be alleviated in part by supplementation with high concentrations of RNA polymerase III. Second, egg extract destabilizes transcription complexes formed with oocyte but not somatic 5S RNA genes.

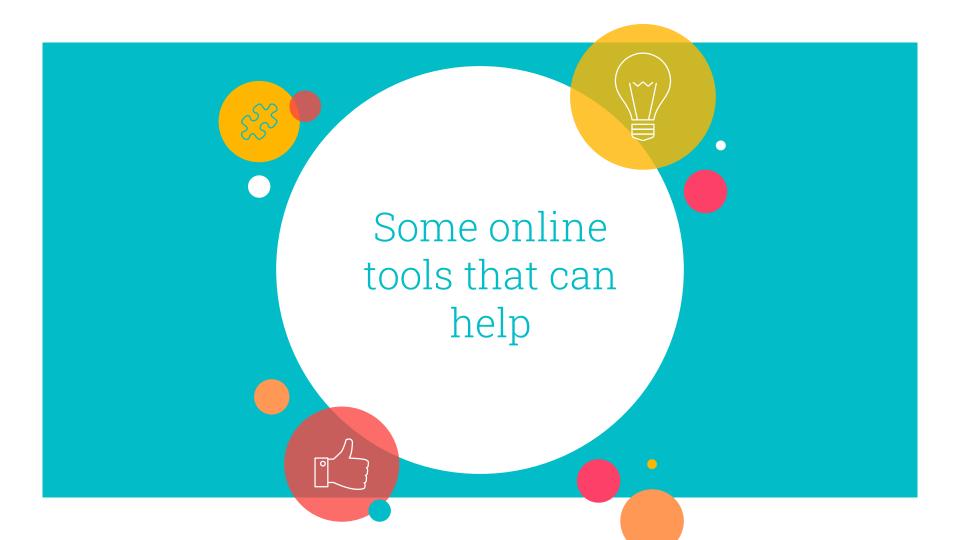
In the egg extract, the availability of TFIIIA limits transcription of the 5S RNA genes. This is surprising because the same concentration of TFIIIA does not limit transcription in the oocyte nuclear extract. In the egg extract, transcription is not limited by RNA polymerase or other factors because transcription of tRNA genes indicates that these factors are in excess over available TFIIIA. When added to the nuclear extract, the egg extract affected the efficiency of transcription in two ways. First, it inhibited transcription generally; this inhibition could be alleviated in part by supplementing the mixture with high concentrations of RNA polymerase III. Second, the egg extract destabilized transcription complexes formed by oocyte but not by somatic



- Place subjects & verbs as closely together as possible
- Use stress positions to introduce new topics/concepts, establish relationships between topics, and establish a primary topic for a given paragraph
- Use strong verbs to emphasize your points



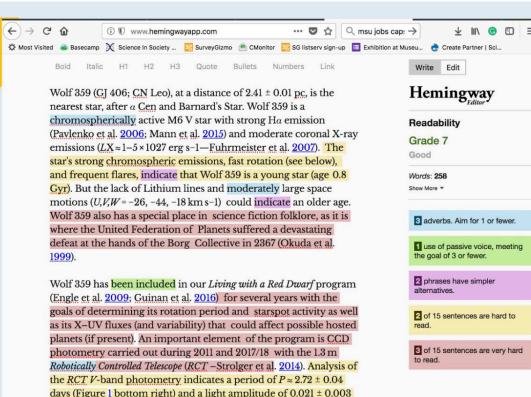






mag.

# Hemingway App





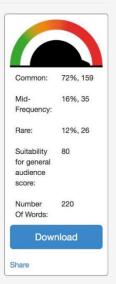


Dr-Jargonizer

#### Result

Wolf 359 (GJ 406; CN Leo), at a distance of 2.41 ± 0.01 pc, is the nearest star, after a Cen and Barnard's Star. Wolf 359 is a chromospherically active M6 V star with strong Ha emission (Pavlenko et al. 2006; Mann et al. 2015) and moderate coronal X-ray emissions (LX≈1-5×1027 erg s-1-Fuhrmeister et al. 2007). The star's strong chromospheric emissions, fast rotation (see below), and frequent flares, indicate that Wolf 359 is a young star (agelesssim0.8 Gyr). But the lack of Lithium lines and moderately large space motions (U,V,W=-26, -44, -18kms-1) could indicate an older age. Wolf 359 also has a special place in science fiction folklore, as it is where the United Federation of Planets suffered a devastating defeat at the hands of the Borg Collective in 2367 (Okuda et al. 1999).

Wolf 359 has been included in our Living with a Red Dwarf program (Engle et al. 2009; Guinan et al. 2016) for several years with the goals of determining its rotation period and starspot activity as well as its X-UV fluxes (and variability) that could affect possible hosted planets (if present). An important element of the program is CCD photometry carried out during 2011 and 2017/18 with the 1.3m Robotically Controlled Telescope (RCT -Strolger et al. 2014). Analysis of the RCT V-band photometry indicates a period of P ≈  $2.72 \pm 0.04$  days (Figure 1 bottom right) and a light amplitude of  $0.021 \pm 0.003$  mag.



Start

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scienceandpublic.com



Helpful reading

- The Science of Scientific Writing,
   Gopen & Swan
- Writing Science in Plain English,
   Anne Greene
- Scientific Writing & Communication, Angelika Hofmann







# Thanks!

Any questions?

Elizabeth Lenaghan e-lenaghan@northwestern.edu

