POLISHING YOUR ARTICLE IN ENGLISH: A HANDS-ON APPROACH

Karie Friedman
Former Assistant Editor
Reviews of Modern Physics
karie@fairpoint.net

“Você esta por sua conta, cara.”

Work on the subject usually starts with a litany. Such as: Quadrupole effective charges for neutrons q_ν=0.5 and protons q_π=1.5 and bare g factors g^s_π=5.5857 μ_N, g^s_ν=-3.3826 μ_N, g^l_π=1.0 μ_N and g^l_ν=0.0 μ_N in $M1$ transitions and moments are used. Except when the M1 transitions are fully dominated by the spin term, the use of effective g factors does not modify the results very much due to the compensation between the spin and orbital modifications.

Then some spectrum: The yrast band of ^{51}Mn, calculated in the full pf shell space is compared in Fig. 27 with the experimental data. The first part of the test is passed. At most the examiner will complain about slightly too high, high-spin states.

Finally the transitions: The transitions in Table IV are equally satisfactory. Note the abrupt change in both $B(M1)$ and $B(E2)$ for $J = (17/2)^-$, beautifully reproduced by the calculation. The origin of this isomerism is in the sudden alignment of two particles in the $1f_{7/2}$ orbit, which provides an intuitive physical explanation for the abrupt change in the MED (Bentley *et al.*, 2000).

At the end one can add some extras: The electromagnetic moments of the ground state are also known: Their values μ_{exp}=3.568(2)μ_N and Q_{exp}=42(7) efm^2 (Firestone, 1996) compare quite well with the calculated μ_{th}=3.397μ_N and Q_{th}=35 efm^2.

Karie Friedman

You are the reader's guide over unfamiliar terrain.

What does the reader already know?

What does he hope to learn from you?

What value can you add beyond figures and tables?

Karie Friedman

Use helpful phrases for transitions and for establishing a relationship with your reader.

Consider…

Contrast this with…

Up to this point, we…

Let us take a closer look at…

Remember that…

It is sometimes helpful to think of t as…

Going beyond this approximation…

Karie Friedman

Engage the reader with a question.

Instead of

The reason for solving the Cauchy problem first is … or
We solve the Cauchy problem first because …

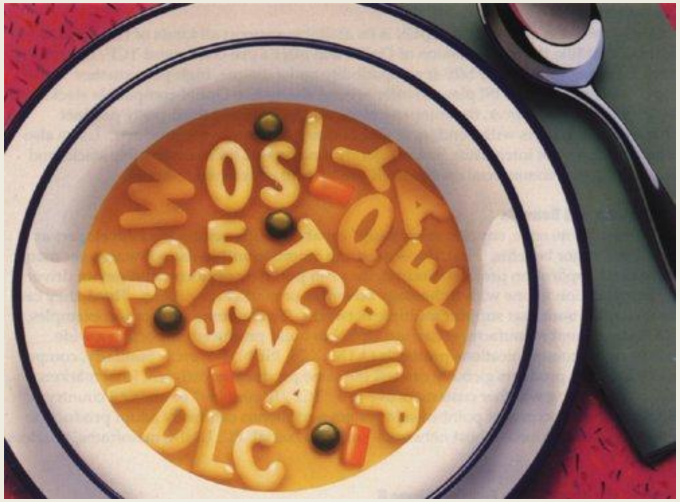
you could say

Why solve the Cauchy problem first?

Karie Friedman

Be selective about acronyms. Too many exclude the nonspecialist and seem unfriendly.

"These allowed parameter regions are labeled as *MSW small mixing angle* (SMA), *MSW large mixing angle* (LMA), *MSW low mass* (LOW), and *vacuum oscillations* (VAC). Before including the SNO (CC) data, the best fit corresponded to the SMA solution, but after SNO the best fit corresponds to the LMA solution. For the LMA solution, oscillations for the 8B neutrinos occur in the adiabatic regime, and the survival probability is higher for lower-energy neutrinos."



Karie Friedman

Use passive constructions to place the most important element first.

Which do you wish to emphasize?

An SEM was used to examine the surface defects of the MoGe thin films.

Surface defects of the MoGe thin films were examined using an SEM.

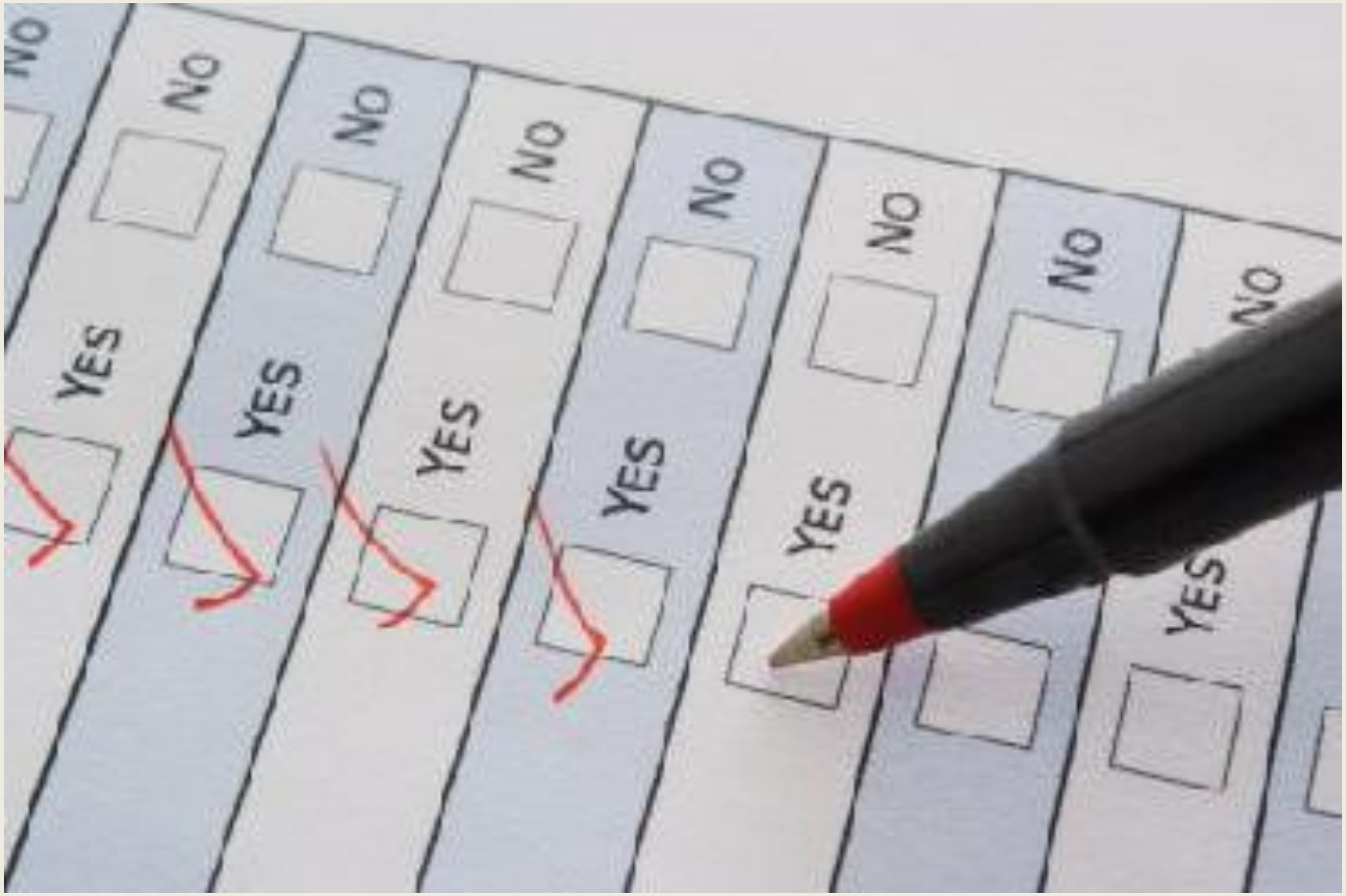
Molybdenum-germanium thin films were examined for surface defects using an SEM.

Use active constructions for vigor and economy.

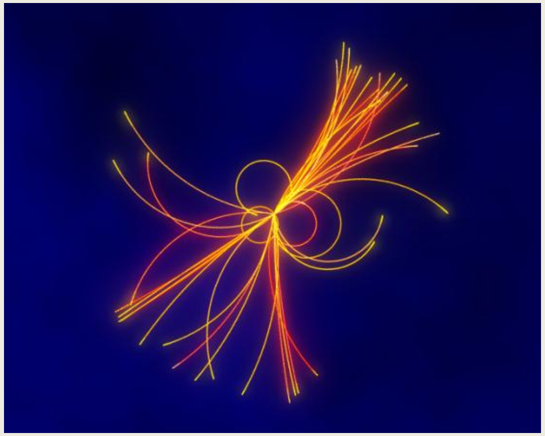
Passive: A discussion of intrinsic pinning is offered in Sec. VIII.

Active: In Sec. VIII we discuss intrinsic pinning.

Check your draft for common problems.

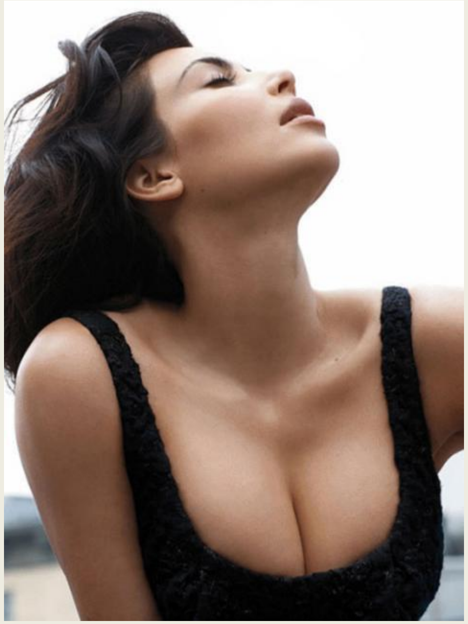


Spell Check suggests…



Boson

Bison



Bosom

Karie Friedman

A Nine-Point Inspection for Your Article

1. Grandiose Introduction?
2. Latinate English
3. Past tense vs. present perfect
4. Pacing: sentence length and paragraph length
5. Comparisons
6. Tricky prepositions
7. Frequently misused words
8. Articles
9. Idioms

Karie Friedman

Have you resisted the temptation to overstate?

Watch out for inflationary language in your introduction:

a new generation
at the frontiers
profound influence
many different fields
new technologies
the pace of progress
cannot be overstated

Is your vocabulary weighted too heavily with words of Latin origin?

initial	first
location	place
determine	find
utilize	use
similar to	like
attempt	try

Karie Friedman

Example 1

Too many Latinate words, heavy:

An initial outline of the most feasible candidate states and of their experimental identification will be followed by a discussion of …

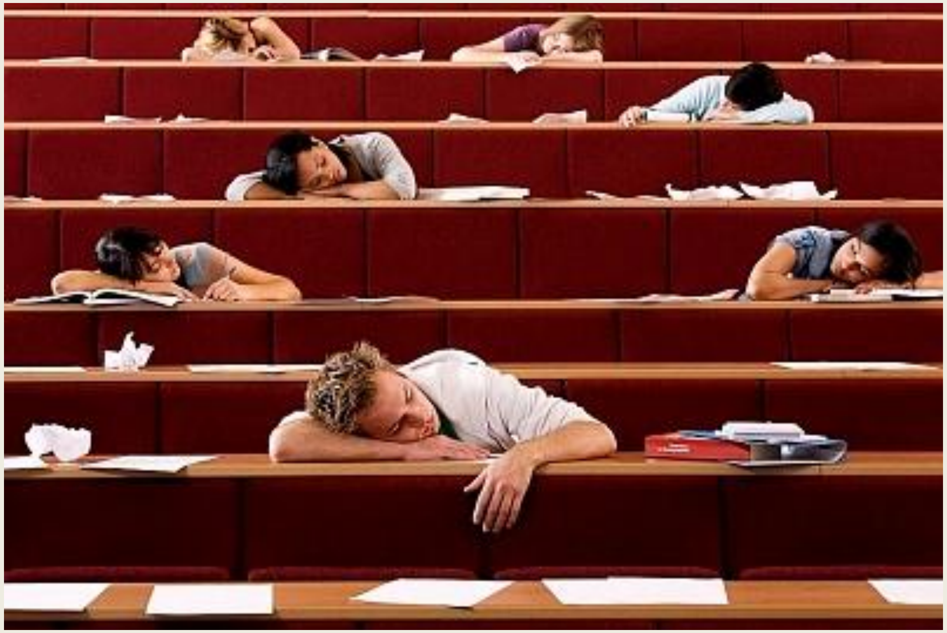
Better balance of Latinate and Anglo-Saxon words:

We first outline the most likely candidate states and how one might go about distinguishing them experimentally. Next we discuss…

Example 2. How to put your reader to sleep

Objective consideration of contemporary phenomena compels the conclusion that success or failure in competitive activities exhibits no tendency to be commensurate with innate capacity, but that a considerable element of the unpredictable must inevitably be taken into account.

George Orwell's version of a famous Biblical passage.



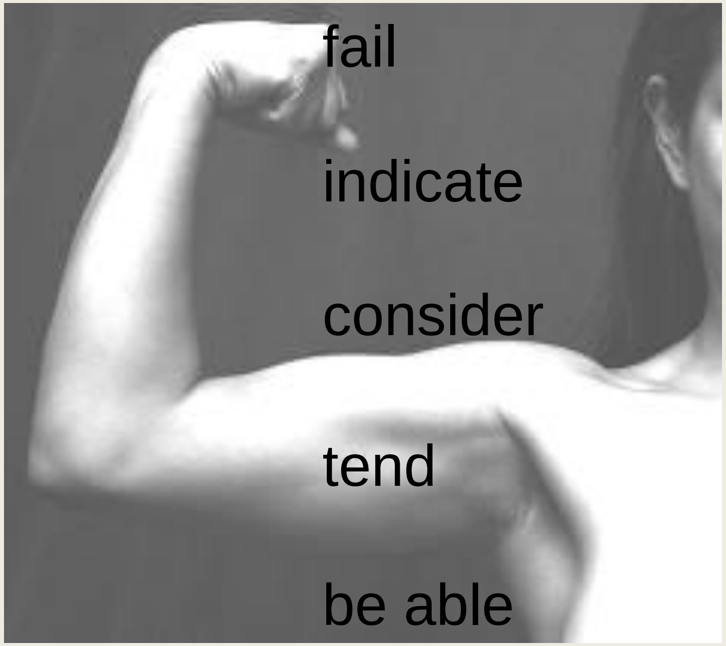
Karie Friedman

The same passage as translated for the King James version of the Bible (17^{th} century).

I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong; neither yet bread to the wise, nor yet riches to men of understanding, nor yet favor to men of skill; but time and chance happeneth to them all.

Ecclesiastes 9: 11

You can also replace flabby phrases with active forms of the same verb.



make a decision	decide
experience failure	fail
give indications of	indicate
place under consideration	consider
exhibit a tendency	tend
have the capability	be able
perform a measurement	measure

Karie Friedman

Reducing your use of –ion will add muscle to your writing.

The human immune system is responsible not only for the identification of foreign molecules, but also for actions leading to their immobilization, neutralization, and destruction. (25 words)

The human immune system not only identifies foreign molecules, but also immobilizes, neutralizes, and destroys them. (16 words)

Karie Friedman

Have you used the appropriate tense to look back?

Way back (Past Tense):
César demonstrated in 2009 …

Back. Not necessarily long ago but completed (Past Tense):
We studied the effect of dimensionality …

Not so far back. Perhaps still continuing (Present Perfect):
Recent research has focused on …
As we have shown …

Karie Friedman

Which page looks more inviting to read?

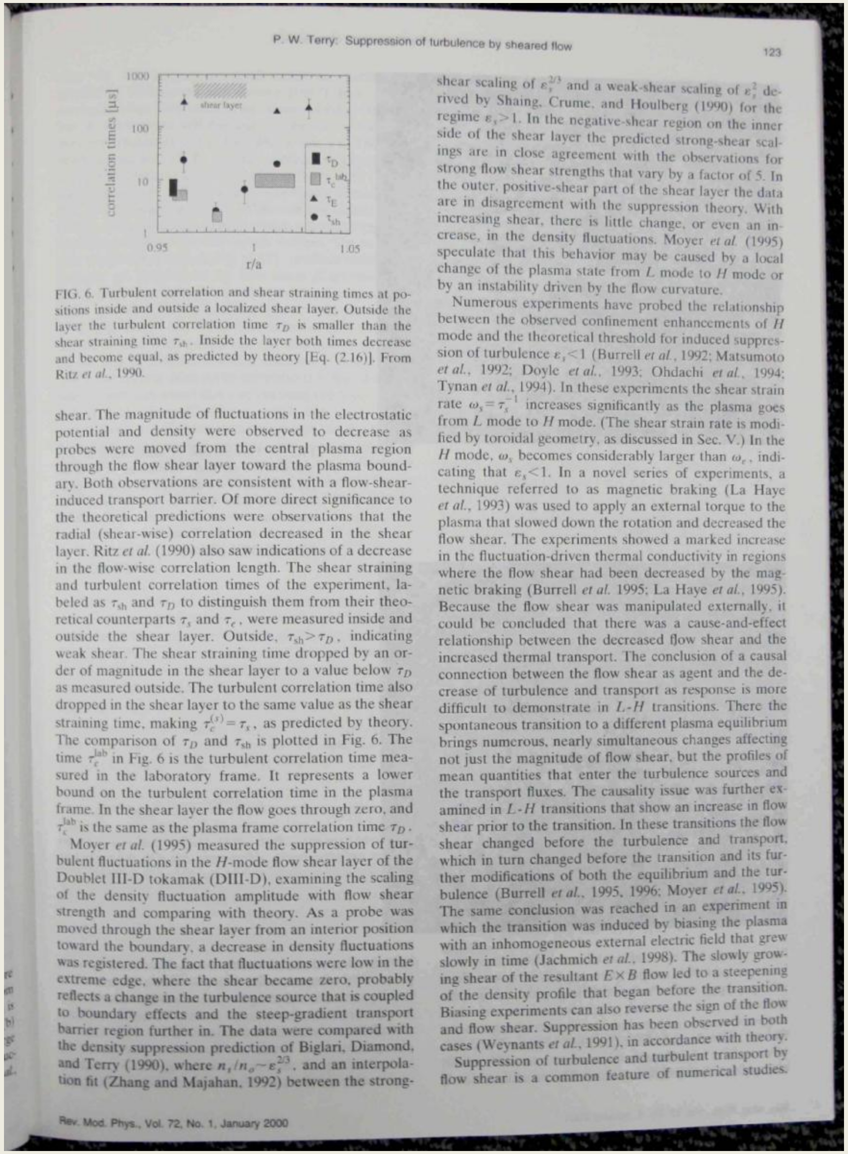


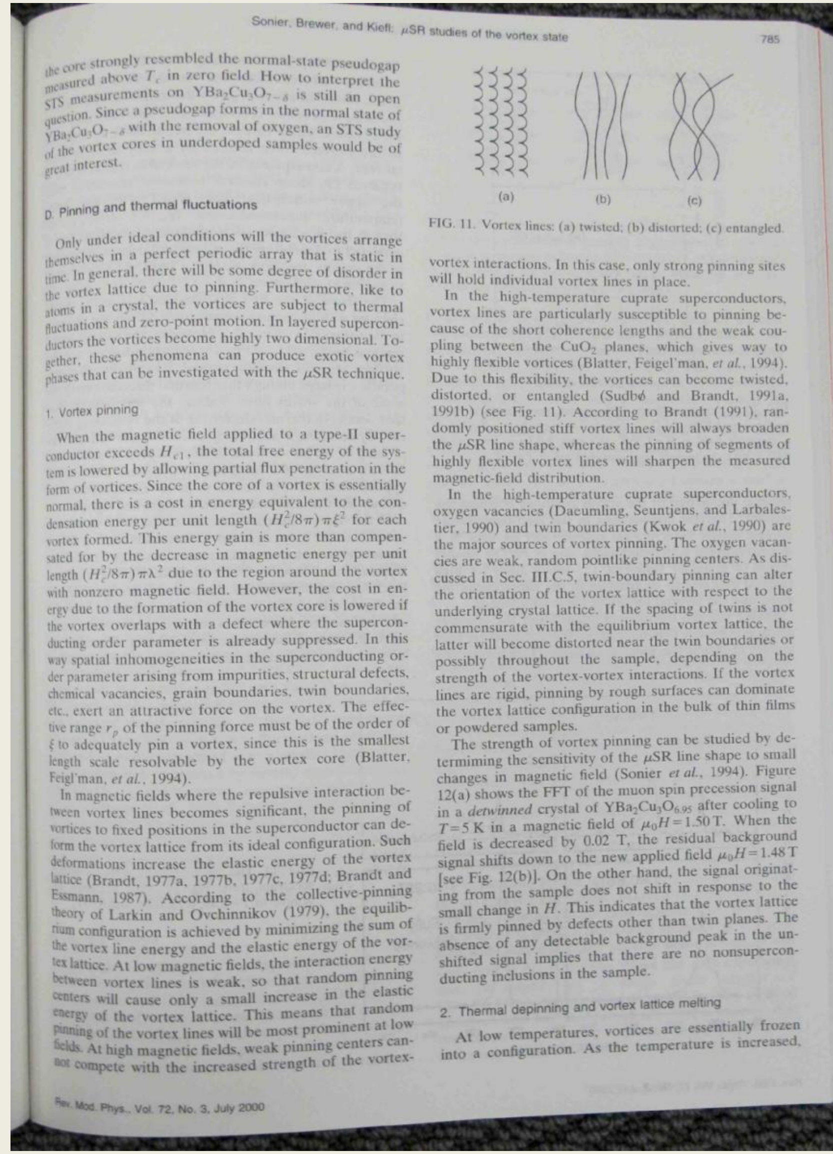
FIG. 6. Turbulent correlation and shear straining times at positions inside and outside a localized shear layer. Outside the layer the turbulent correlation time τ_D is smaller than the shear straining time τ_{sh}. Inside the layer both times decrease and become equal, as predicted by theory [Eq. (2.16)]. From Ritz *et al.*, 1990.

shear. The magnitude of fluctuations in the electrostatic potential and density were observed to decrease as probes were moved from the central plasma region through the flow shear layer toward the plasma boundary. Both observations are consistent with a flow-shear-induced transport barrier. Of more direct significance to the theoretical predictions were observations that the radial (shear-wise) correlation decreased in the shear layer. Ritz *et al.* (1990) also saw indications of a decrease in the flow-wise correlation length. The shear straining and turbulent correlation times of the experiment, labeled as τ_{sh} and τ_D to distinguish them from their theoretical counterparts τ_s and τ_c, were measured inside and outside the shear layer. Outside, $\tau_{sh}>\tau_D$, indicating weak shear. The shear straining time dropped by an order of magnitude in the shear layer to a value below τ_D as measured outside. The turbulent correlation time also dropped in the shear layer to the same value as the shear straining time, making $\tau_c^{(s)}=\tau_s$, as predicted by theory. The comparison of τ_D and τ_{sh} is plotted in Fig. 6. The time τ_c^{lab} in Fig. 6 is the turbulent correlation time measured in the laboratory frame. It represents a lower bound on the turbulent correlation time in the plasma frame. In the shear layer the flow goes through zero, and τ_c^{lab} is the same as the plasma frame correlation time τ_D.

Moyer *et al.* (1995) measured the suppression of turbulent fluctuations in the *H*-mode flow shear layer of the Doublet III-D tokamak (DIII-D), examining the scaling of the density fluctuation amplitude with flow shear strength and comparing with theory. As a probe was moved through the shear layer from an interior position toward the boundary, a decrease in density fluctuations was registered. The fact that fluctuations were low in the extreme edge, where the shear became zero, probably reflects a change in the turbulence source that is coupled to boundary effects and the steep-gradient transport barrier region further in. The data were compared with the density suppression prediction of Biglari, Diamond, and Terry (1990), where $n_s/n_o \sim \varepsilon_s^{2/3}$, and an interpolation fit (Zhang and Majahan, 1992) between the strong-shear scaling of $\varepsilon_s^{2/3}$ and a weak-shear scaling of ε_s^2 derived by Shaing, Crume, and Houlberg (1990) for the regime $\varepsilon_s>1$. In the negative-shear region on the inner side of the shear layer the predicted strong-shear scalings are in close agreement with the observations for strong flow shear strengths that vary by a factor of 5. In the outer, positive-shear part of the shear layer the data are in disagreement with the suppression theory. With increasing shear, there is little change, or even an increase, in the density fluctuations. Moyer *et al.* (1995) speculate that this behavior may be caused by a local change of the plasma state from *L* mode to *H* mode or by an instability driven by the flow curvature.

Numerous experiments have probed the relationship between the observed confinement enhancements of *H* mode and the theoretical threshold for induced suppression of turbulence $\varepsilon_s<1$ (Burrell *et al.*, 1992; Matsumoto *et al.*, 1992; Doyle *et al.*, 1993; Ohdachi *et al.*, 1994; Tynan *et al.*, 1994). In these experiments the shear strain rate $\omega_s=\tau_s^{-1}$ increases significantly as the plasma goes from *L* mode to *H* mode. (The shear strain rate is modified by toroidal geometry, as discussed in Sec. V.) In the *H* mode, ω_s becomes considerably larger than ω_c, indicating that $\varepsilon_s<1$. In a novel series of experiments, a technique referred to as magnetic braking (La Haye *et al.*, 1993) was used to apply an external torque to the plasma that slowed down the rotation and decreased the flow shear. The experiments showed a marked increase in the fluctuation-driven thermal conductivity in regions where the flow shear had been decreased by the magnetic braking (Burrell *et al.* 1995; La Haye *et al.*, 1995). Because the flow shear was manipulated externally, it could be concluded that there was a cause-and-effect relationship between the decreased flow shear and the increased thermal transport. The conclusion of a causal connection between the flow shear as agent and the decrease of turbulence and transport as response is more difficult to demonstrate in *L*-*H* transitions. There the spontaneous transition to a different plasma equilibrium brings numerous, nearly simultaneous changes affecting not just the magnitude of flow shear, but the profiles of mean quantities that enter the turbulence sources and the transport fluxes. The causality issue was further examined in *L*-*H* transitions that show an increase in flow shear prior to the transition. In these transitions the flow shear changed before the turbulence and transport, which in turn changed before the transition and its further modifications of both the equilibrium and the turbulence (Burrell *et al.*, 1995, 1996; Moyer *et al.*, 1995). The same conclusion was reached in an experiment in which the transition was induced by biasing the plasma with an inhomogeneous external electric field that grew slowly in time (Jachmich *et al.*, 1998). The slowly growing shear of the resultant $E\times B$ flow led to a steepening of the density profile that began before the transition. Biasing experiments can also reverse the sign of the flow and flow shear. Suppression has been observed in both cases (Weynants *et al.*, 1991), in accordance with theory.

Suppression of turbulence and turbulent transport by flow shear is a common feature of numerical studies.



the core strongly resembled the normal-state pseudogap measured above T_c in zero field. How to interpret the STS measurements on $YBa_2Cu_3O_{7-\delta}$ is still an open question. Since a pseudogap forms in the normal state of $YBa_2Cu_3O_{7-\delta}$ with the removal of oxygen, an STS study of the vortex cores in underdoped samples would be of great interest.

D. Pinning and thermal fluctuations

Only under ideal conditions will the vortices arrange themselves in a perfect periodic array that is static in time. In general, there will be some degree of disorder in the vortex lattice due to pinning. Furthermore, like to atoms in a crystal, the vortices are subject to thermal fluctuations and zero-point motion. In layered superconductors the vortices become highly two dimensional. Together, these phenomena can produce exotic vortex phases that can be investigated with the μSR technique.

1. Vortex pinning

When the magnetic field applied to a type-II superconductor exceeds H_{c1}, the total free energy of the system is lowered by allowing partial flux penetration in the form of vortices. Since the core of a vortex is essentially normal, there is a cost in energy equivalent to the condensation energy per unit length $(H_c^2/8\pi)\pi\xi^2$ for each vortex formed. This energy gain is more than compensated for by the decrease in magnetic energy per unit length $(H_c^2/8\pi)\pi\lambda^2$ due to the region around the vortex with nonzero magnetic field. However, the cost in energy due to the formation of the vortex core is lowered if the vortex overlaps with a defect where the superconducting order parameter is already suppressed. In this way spatial inhomogeneities in the superconducting order parameter arising from impurities, structural defects, chemical vacancies, grain boundaries, twin boundaries, etc., exert an attractive force on the vortex. The effective range r_p of the pinning force must be of the order of ξ to adequately pin a vortex, since this is the smallest length scale resolvable by the vortex core (Blatter, Feigl'man, *et al.*, 1994).

In magnetic fields where the repulsive interaction between vortex lines becomes significant, the pinning of vortices to fixed positions in the superconductor can deform the vortex lattice from its ideal configuration. Such deformations increase the elastic energy of the vortex lattice (Brandt, 1977a, 1977b, 1977c, 1977d; Brandt and Essmann, 1987). According to the collective-pinning theory of Larkin and Ovchinnikov (1979), the equilibrium configuration is achieved by minimizing the sum of the vortex line energy and the elastic energy of the vortex lattice. At low magnetic fields, the interaction energy between vortex lines is weak, so that random pinning centers will cause only a small increase in the elastic energy of the vortex lattice. This means that random pinning of the vortex lines will be most prominent at low fields. At high magnetic fields, weak pinning centers cannot compete with the increased strength of the vortex-vortex interactions. In this case, only strong pinning sites will hold individual vortex lines in place.

(a) (b) (c)

FIG. 11. Vortex lines: (a) twisted; (b) distorted; (c) entangled.

In the high-temperature cuprate superconductors, vortex lines are particularly susceptible to pinning because of the short coherence lengths and the weak coupling between the CuO_2 planes, which gives way to highly flexible vortices (Blatter, Feigel'man, *et al.*, 1994). Due to this flexibility, the vortices can become twisted, distorted, or entangled (Sudbø and Brandt, 1991a, 1991b) (see Fig. 11). According to Brandt (1991), randomly positioned stiff vortex lines will always broaden the μSR line shape, whereas the pinning of segments of highly flexible vortex lines will sharpen the measured magnetic-field distribution.

In the high-temperature cuprate superconductors, oxygen vacancies (Daeumling, Seuntjens, and Larbalestier, 1990) and twin boundaries (Kwok *et al.*, 1990) are the major sources of vortex pinning. The oxygen vacancies are weak, random pointlike pinning centers. As discussed in Sec. III.C.5, twin-boundary pinning can alter the orientation of the vortex lattice with respect to the underlying crystal lattice. If the spacing of twins is not commensurate with the equilibrium vortex lattice, the latter will become distorted near the twin boundaries or possibly throughout the sample, depending on the strength of the vortex-vortex interactions. If the vortex lines are rigid, pinning by rough surfaces can dominate the vortex lattice configuration in the bulk of thin films or powdered samples.

The strength of vortex pinning can be studied by determining the sensitivity of the μSR line shape to small changes in magnetic field (Sonier *et al.*, 1994). Figure 12(a) shows the FFT of the muon spin precession signal in a *detwinned* crystal of $YBa_2Cu_3O_{6.95}$ after cooling to $T=5$ K in a magnetic field of $\mu_0H=1.50$ T. When the field is decreased by 0.02 T, the residual background signal shifts down to the new applied field $\mu_0H=1.48$ T [see Fig. 12(b)]. On the other hand, the signal originating from the sample does not shift in response to the small change in *H*. This indicates that the vortex lattice is firmly pinned by defects other than twin planes. The absence of any detectable background peak in the unshifted signal implies that there are no nonsuperconducting inclusions in the sample.

2. Thermal depinning and vortex lattice melting

At low temperatures, vortices are essentially frozen into a configuration. As the temperature is increased,

Karie Friedman

Two models for making a comparison

Model A. “Shorter than …”

This time scale is significantly shorter than that predicted by Eq. (23).

Model B. “Short compared to …”

Radiative fluxes from Supernova 1987A are still changing on time scales short compared to journal publication time scales. (Virginia Trimble, in 1988)

The trick is not to mix elements of the two models.

Wrong: Power corrections are greater for the delta as compared to the nucleon.

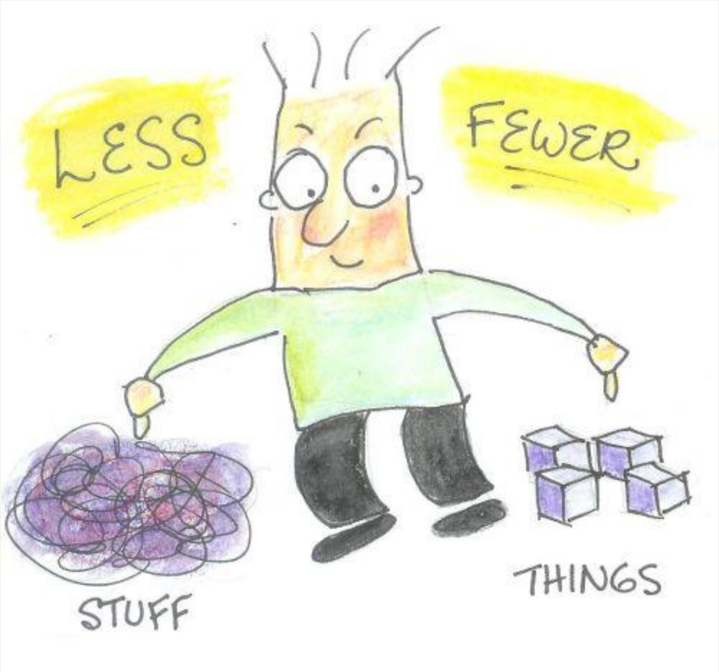
Model A: Power corrections are greater for the delta than for the nucleon.

Model B: Power corrections for the delta are great compared to those for the nucleon.

How to choose between “fewer” and “less”

Fewer words, orbits, applications, pollen grains, data, parameters (all countable).

Less soup, noise, resistance, silicon, diffusion, contrast (not countable, though they can be measured).



Karie Friedman

Forget this expression: On the contrary

To contrast two things, use “in contrast” or—if they are opposites—“conversely.”

“On the contrary” is a retort in response to someone else’s statement, not an analytic observation.

Karie Friedman

Caution: Absolutes don't need modifiers.

There is no such condition as	more critical
	most unique
	very essential
	a little bit pregnant
Exception, for scientists:	good agreement

Have you used the correct prepositions?

Memorize these exceptions to the standard comparison “higher than,” “faster than,” “more diffuse than” etc.

Similar to

Different from

Twice as many as

The preposition “of” is frequently not used when it should be.

our understanding of	not understanding about
an example of	not example for
Director of	not Director for
the experiments of	not experiments by
the review article of	by is not wrong, but of is used more often

Karie Friedman

Check your manuscript for these frequently misused words.

specially

obtain

nowadays

evidently, apparently

aspects

substitute, replace

“Specially” may be what you hear in rapid speech, but it is written Especially.

“Obtain” takes a direct object (which may be a displayed equation). You can’t “obtain that …,” but you can “find that ….”

Nowadays, people don’t use “nowadays” much. Better choices: today, these days, at present.

Unaccompanied aspects are vague and unidiomatic. Provide an object (aspects of what?) or use another word.

of this problem
Two aspects deserve special mention.
^

features
Section V treats off-equilibrium ~~aspects~~.

ways
The presence of uv light is relevant in several ~~aspects~~.

Karie Friedman

Evidently ≠ It is evident that.
Apparently ≠ It is apparent that.

In English these adverbs carry an overtone of doubt or conjecture. For a more forceful statement, spell out “It is evident that” or choose another word.

clearly
obviously
plainly

Karie Friedman

“Substitute” and “Replace” describe the same operation from different angles.

Consider two items, the original *r* and the item that will take its Place *r’*.

Imagine them as football players, say, Neymar on the pitch and Robinho who is being sent in to relieve him.

“Replace” always takes as a direct object the original (Neymar), with no preposition before the object.

They replaced Neymar by Robinho.
Robinho replaces Neymar.

We replace *r* by *r’* .

Note: You can also use “with” instead of “by.”

Karie Friedman

“Substitute” names the replacement (Robinho) first and is always used with the word “for.”

They substituted Robinho for Neymar.
Robinho will substitute for Neymar.

We substitute *r’* for *r*.
r’ is substituted for *r*.

Karie Friedman

Use the indefinite article “a” or “an” for a singular noun that is referred to “in general,” rather than as a specific instance.

a hallmark

a crossover

an exception

an STM tip

a sample

a small variation

Karie Friedman

Use the definite article “the” for a noun (singular or plural) that is particular rather than general.

the samples [in this experiment]

the data [on this particular problem]

the local density of states

the Anderson model

the abundances of various elements

The surface film literature

Karie Friedman

Use NO article for

Plural nouns	Singular nouns that represent a general condition, behavior or class
scattered electrons	Rayleigh collapse
black holes	orthogonality
spectra	nondamped behavior
single crystals	sin ϕ dependence
operators	time-reversal symmetry breaking

Karie Friedman

Some Exceptions

Require Definite Articles	Take No Articles
the existence of	Eq. (20)
the presence of	Sec. III
the absence of	*Physical Review Letters*

Use of Indefinite Articles with “Such”

With a singular noun, use “a” or “an”

> the best candidates for such a spin filter
> when we employ such an approach

With a plural noun, use no article

> to eliminate such temperature spikes
> such failures indicate

After “no such” use no article

> there is no such thing as
> no such spectrum was observed

Karie Friedman

A few useful English idioms

in recent years

no longer

of interest for and of interest to

verbs of empowerment: allow, permit, enable

the question

as is the case, as is borne out, as is shown

In recent years	Use this wording with the Present Perfect tense.
No longer	Better than “not any longer”: we no longer assume no longer applicable
Of interest	“to” people (the condensed matter community) “for” abstractions (the study of quantum measurement)

The Question – Get right to it. Introduce with a comma or "of."

will answer the question, which model
will answer the question of its origin
will answer the question of whether

Inserting other words such as "concerning," "as to," or "about" is unnecessary and unidiomatic:

will answer the question concerning its origin
will answer the question about which model
will answer the question as to whether

As is the case – a pattern that omits “it”

“It” is implied and should not be stated in these expressions:

as is the case

as is borne out

as is shown

When using this pattern with “seen” do not tell your reader what he sees, rather suggest what can be seen:

Presumptuous:	as is seen, as seen
Better:	as can be seen

Karie Friedman

Verbs of empowerment should be followed by an object, not an infinitive.

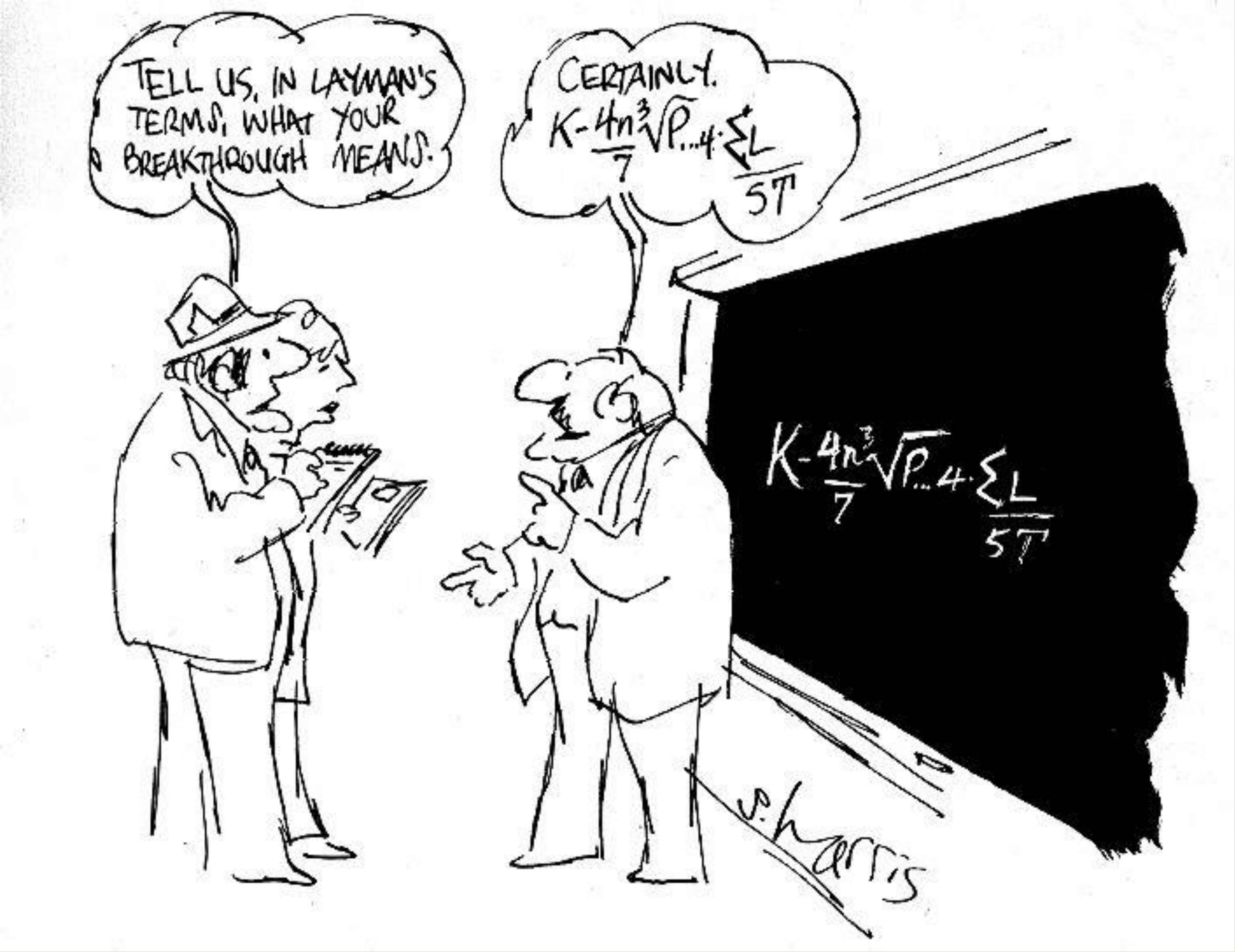
A person	this method allows us to distinguish
A process	this method makes possible probes of new areas
	this method permits deeper penetration
Wrong:	this method allows to distinguish

Karie Friedman

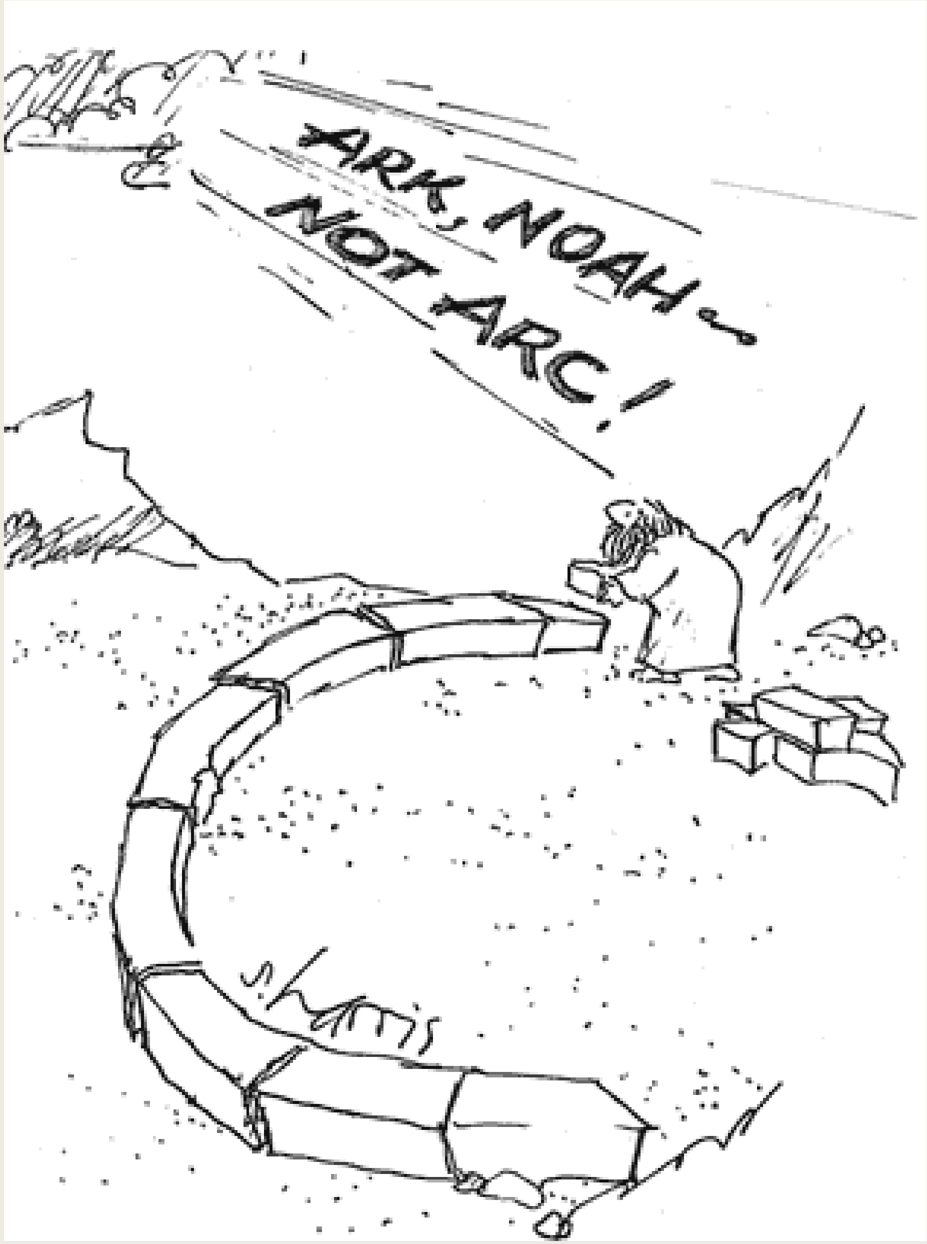
A Nine-Point Inspection for Your Article

1. Grandiose Introduction?
2. Latinate English
3. Past tense vs. present perfect
4. Pacing: sentence length and paragraph length
5. Comparisons
6. Tricky prepositions
7. Frequently misused words
8. Articles
9. Idioms

Karie Friedman



Karie Friedman



Karie Friedman

"Can you put more nudity in this?"

Karie Friedman

"I'm sorry, Prof. Minskov, but that article about Minskov's Theory... they want someone else to write it."

Karie Friedman