



Elements of Scientific Writing

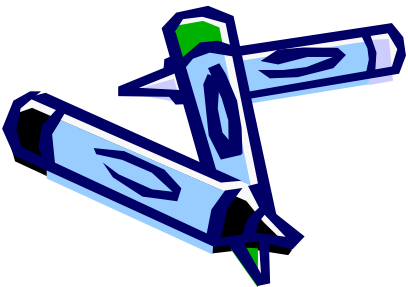
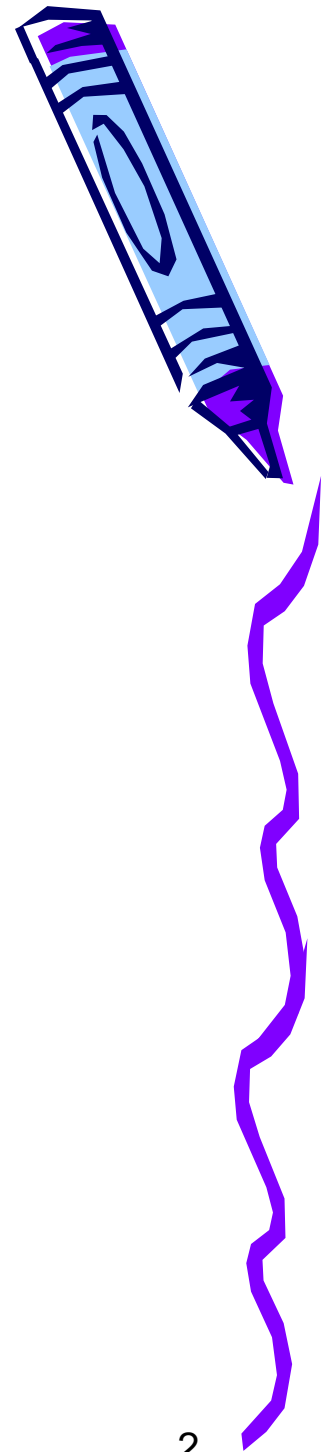
Lecture 1

Georgia Cancer Center
February 13, 2018

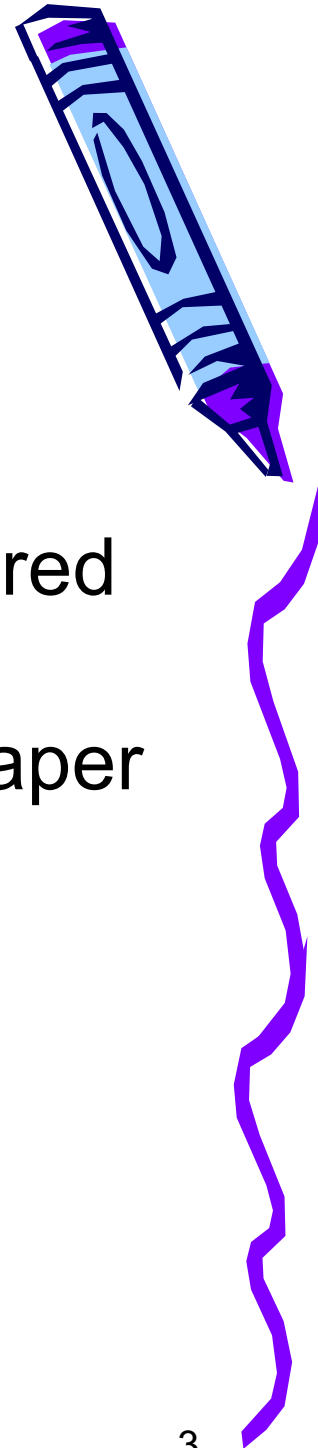


Georgia Cancer Center
Professional Skills Development
Writing Program

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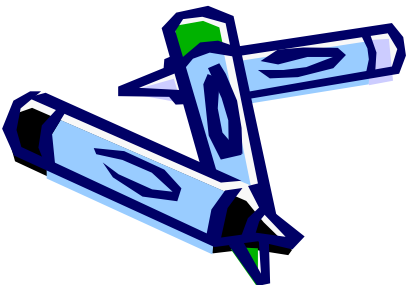


Outline



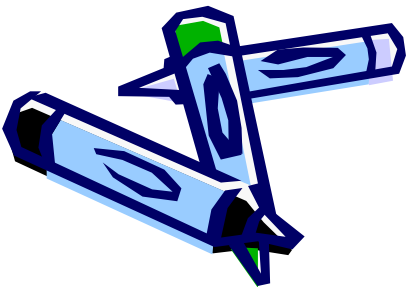
- Session 1: Elements of Scientific Writing
- Session 2: Common Difficulties Encountered by Non-Native English Speakers
- Sessions 3-4: How to Write a Scientific Paper
- Session 5: Bibliographic Reference

Fall Semester: Grant Writing presentations



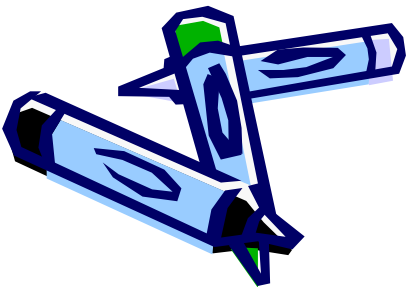
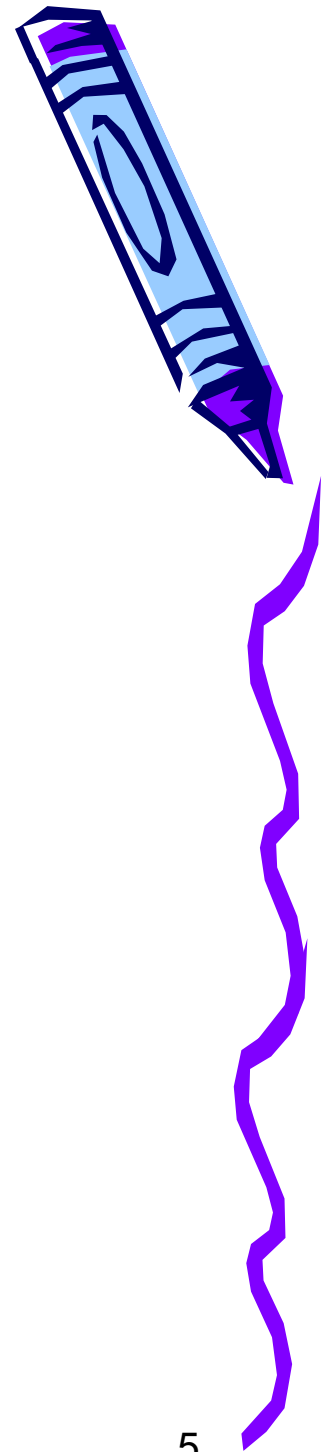
“A naturalist’s life would be a happy one if he had only to observe and never to write.”

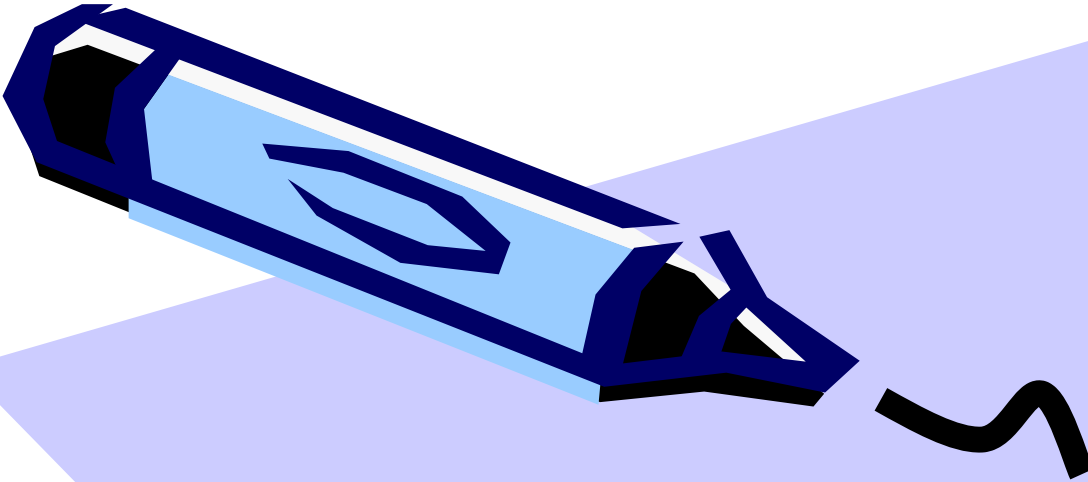
Charles Darwin



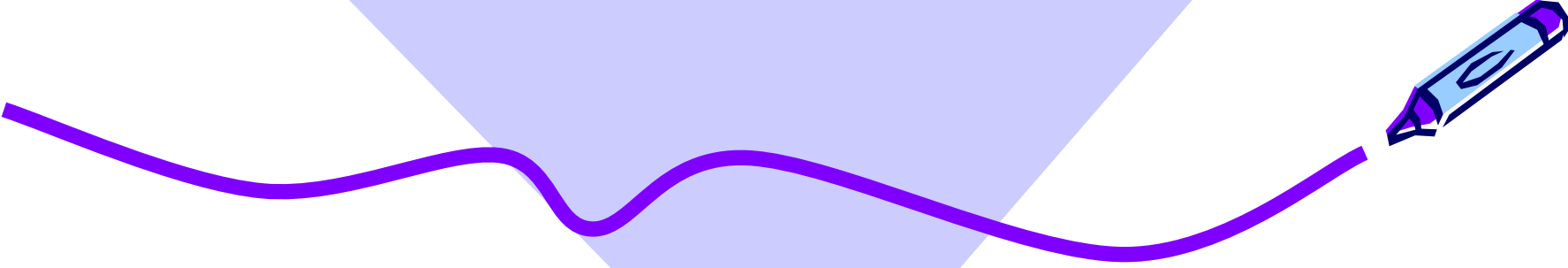
Lecture 1: Topics

- What is scientific writing?
 - How does it differ from writing in general?
- Grammar & other writing essentials
- Plain language
- Diagramming sentences
- Reference Books





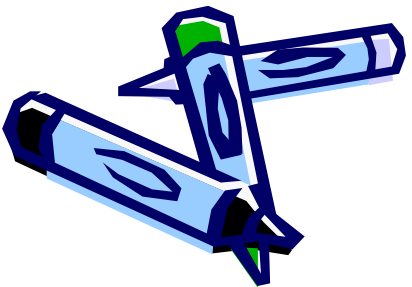
Why is
Scientific Writing
so difficult?

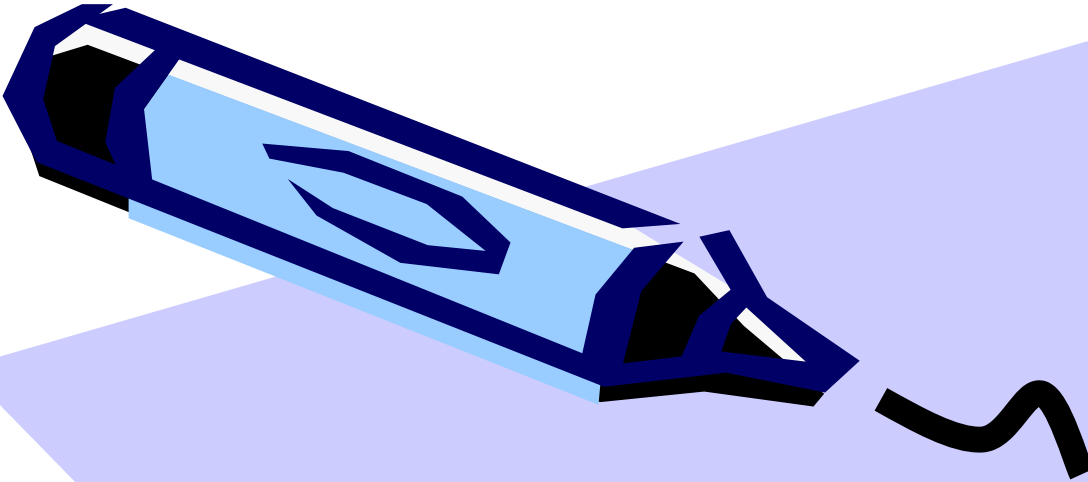


- Trying to convey complex ideas
- Long sentences
- Need to be specific, so lots of modifiers
- It's not the way we usually speak
- Where do phrases belong in the sentence?
- Common issues of grammar
- Spelling errors, including typos
- Often deadline-driven
- Writer's block?



So let's try to make it
a little easier
and palatable

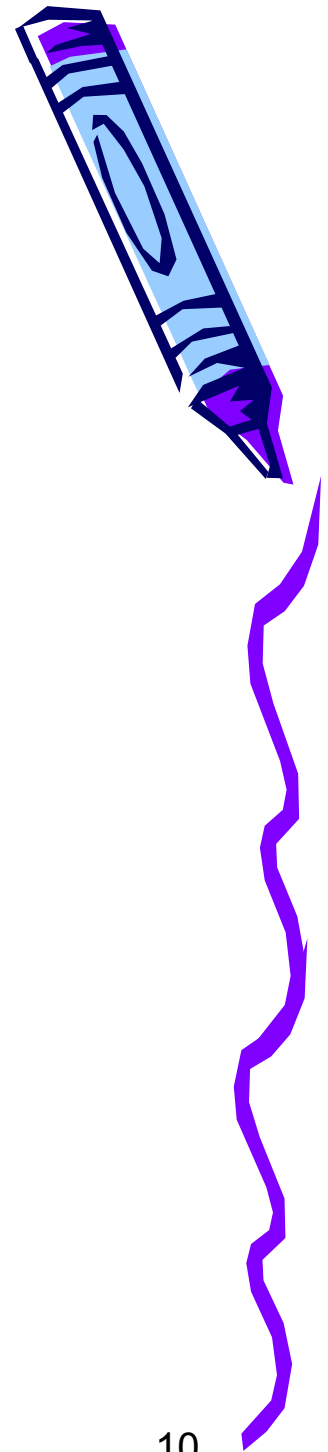




What is scientific writing?

How does it differ from other writing?



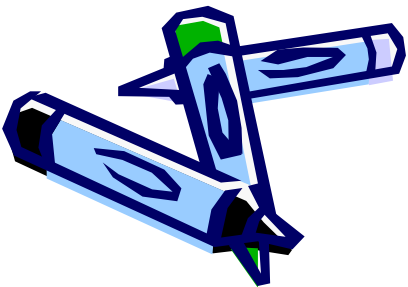


Characteristics

- More direct and to the point
- Not poetic or flowery
- More precise

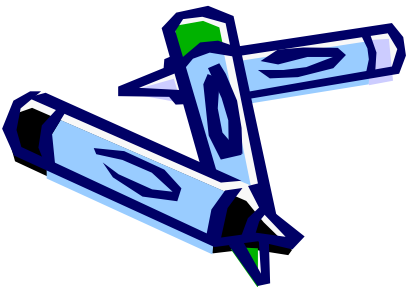
Misconceptions

- Passive voice (not necessarily)
- Wordy (doesn't need to be)





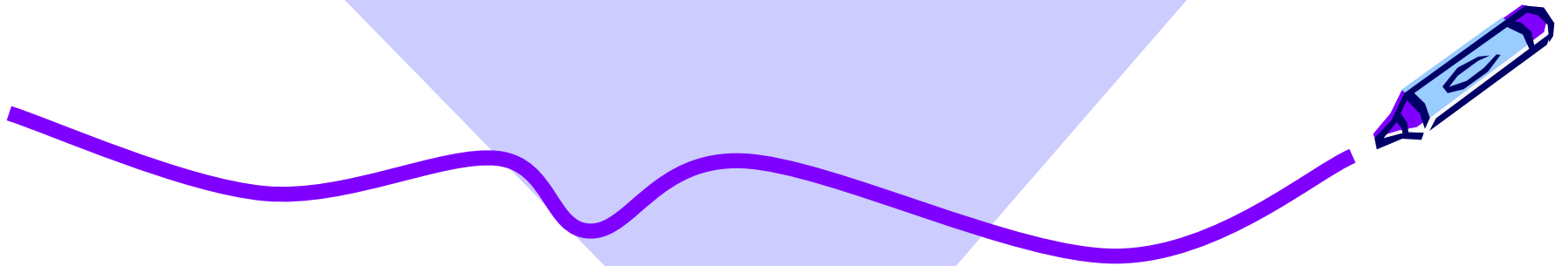
Our goal is to make **your**
scientific writing readable
and easy to understand



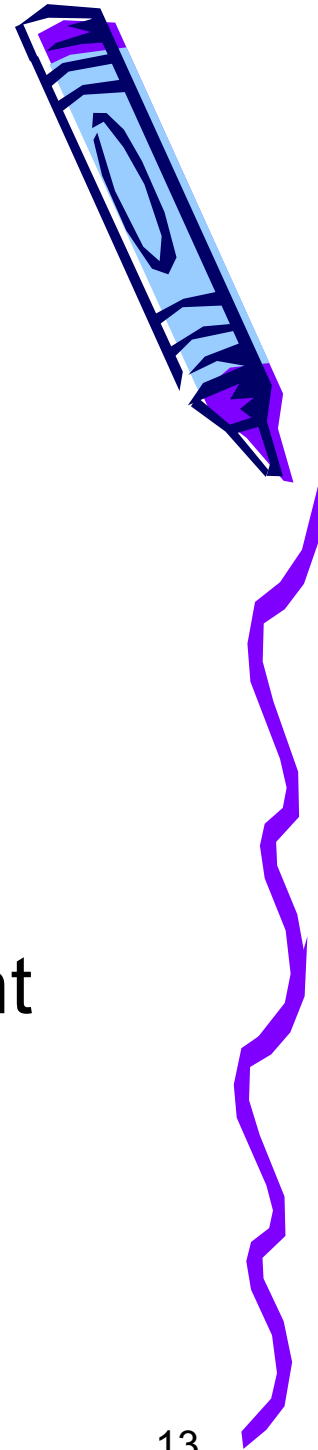


Grammar & Other Writing Essentials

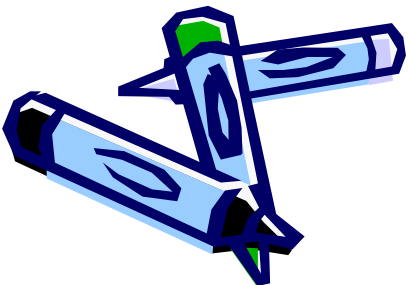
Just a brief review....



Sentence



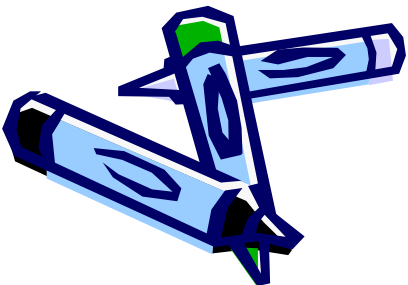
- Consists of subject, verb, and object
 - Keep subject and verb close together!
 - *Serologic studies have shown that primary infection usually occurs during childhood.*
- Each sentence should make a single point
- 20-22 words per sentence

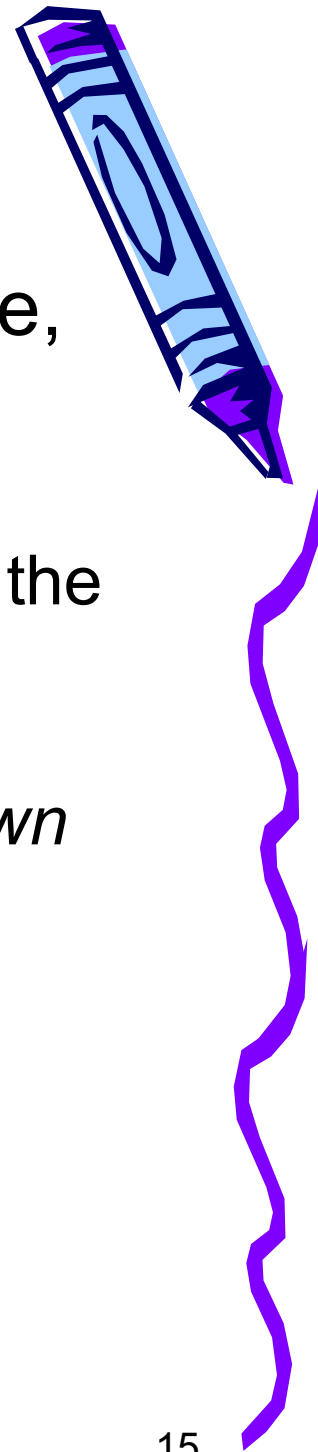


What the reader expects in a sentence



- Main action of the sentence is expressed in the main verb
- Subject is the agent of the action (if the agent is important)
- Sentence tells a story
 - *In this report, we describe a systematic study of the role of immunodeficiency in BKV and JCV viruria.*



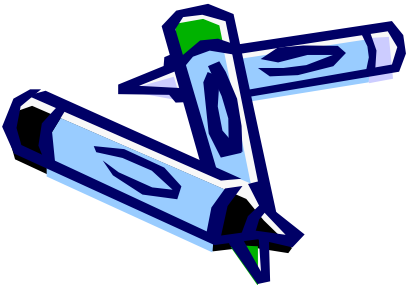
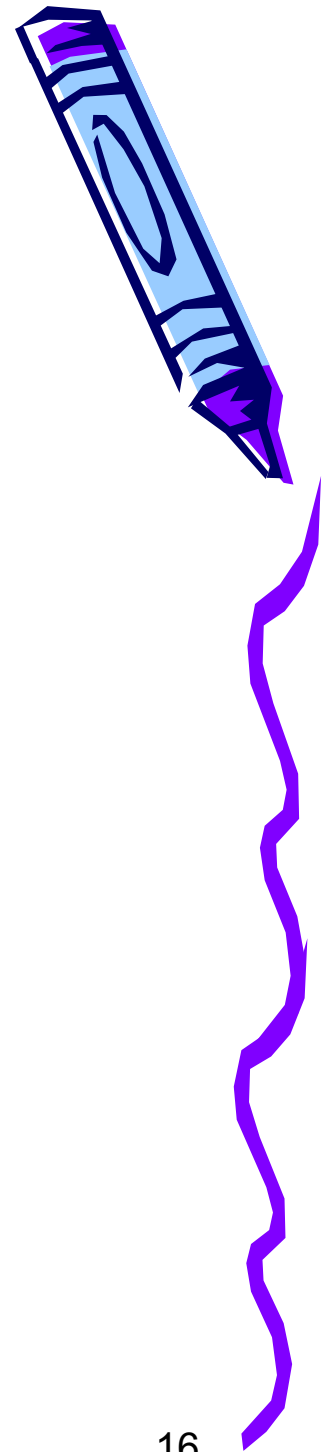


- Subject is at the beginning of the sentence, unless there is a dependent clause or introductory phrase.
 - In which case, subject will immediately follow the clause
 - *Aside from the kinase domain and phosphorylation sites, virtually nothing is known about structure-function relationships in the enzyme.*
- Verb immediately follows the subject

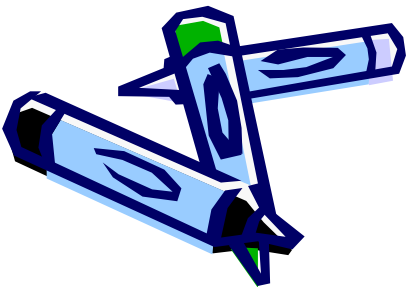


Positions in the Sentence

- **Topic** position is at the beginning of the sentence.
 - Contains old information
 - Links us backward
- **Stress** position should be at end of the sentence.
 - Point of closure
 - Receives special emphasis
 - New information

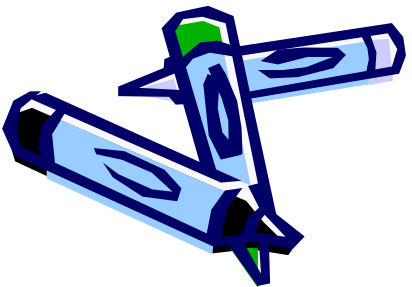


Digestion of archetype virus should give a radiolabeled SacI fragment of 129 bp and a radiolabeled SphI fragment of 175 bp.

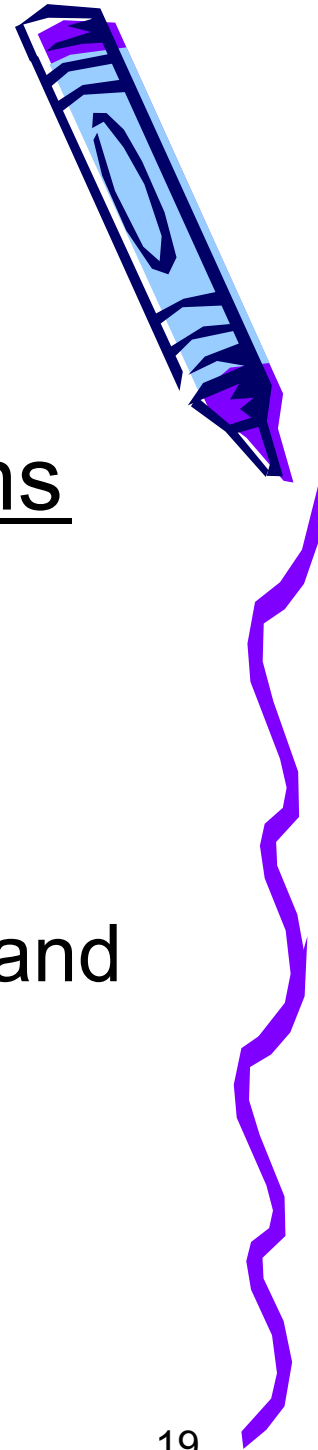


Which are topic and stress positions?

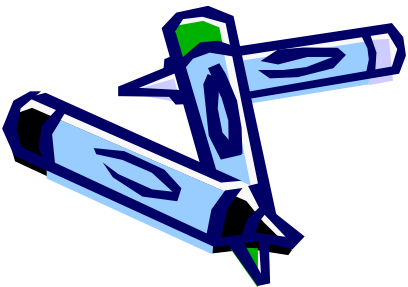
Digestion of archetype virus should give a radiolabeled SacI fragment of 129 bp and a radiolabeled SphI fragment of 175 bp.



Voice: active vs passive

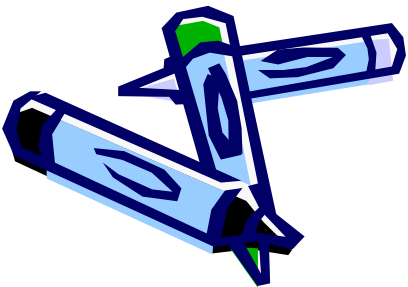
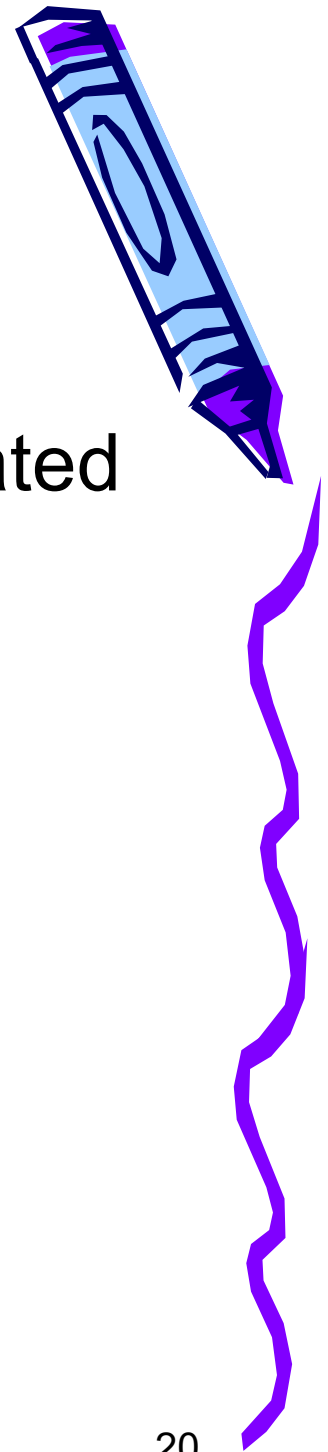


- **Active voice:** when subject performs the action of the verb
- **Passive voice:** when subject undergoes the action of the verb
 - Usually consists of part of verb “to be” and past participle of verb



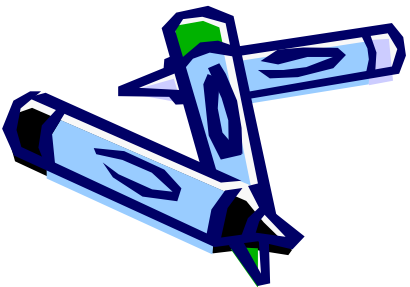
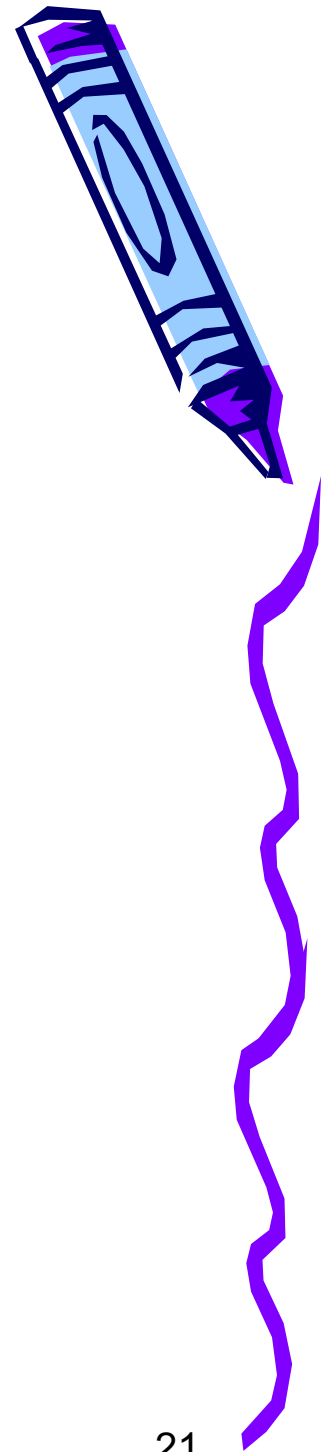
Passive voice

- Makes sentences more wordy & complicated
- Used to be recommended for scientific writing
 - NOT ANY MORE!!!
- Use passive when agent is not important
 - *Cells were cultured in DME.....*
 - Does not matter who cultured them!
 - Active: *We cultured the cells in DME.....*



Active voice

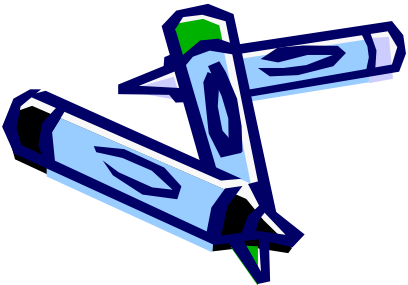
- Adds action to the sentence
- Adds interest
- Makes sentences shorter
 - *We analyzed.....*



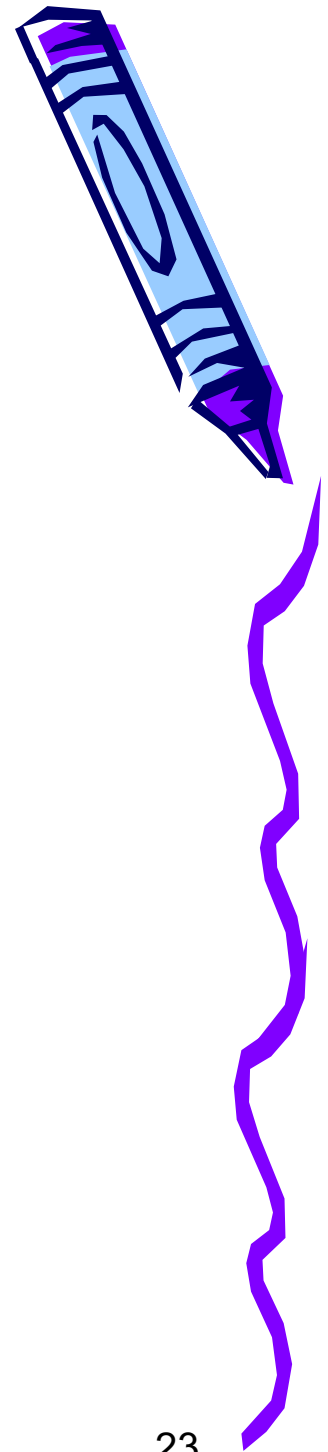
Convert passive to active



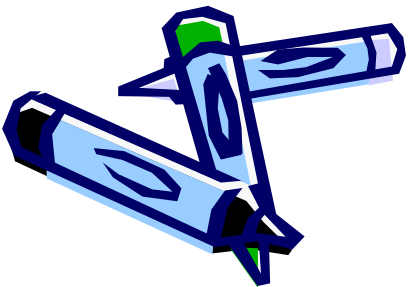
- Look for buried verbs hidden in words that end in -ion
 - *A careful inspection of the esophageal mucosa is performed as the endoscope is withdrawn.*
 - *The physician inspects the esophageal mucosa as the endoscope is withdrawn.*
 - *The physician inspects the esophageal mucosa as he withdraws the endoscope.*



Two of the most common errors made in scientific writing.....



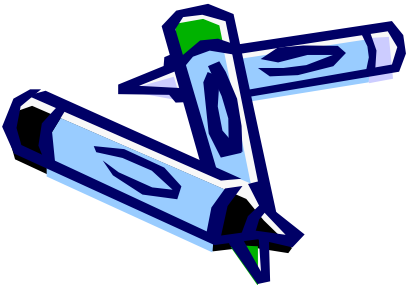
- Subject-verb disagreement
- Dangling participles

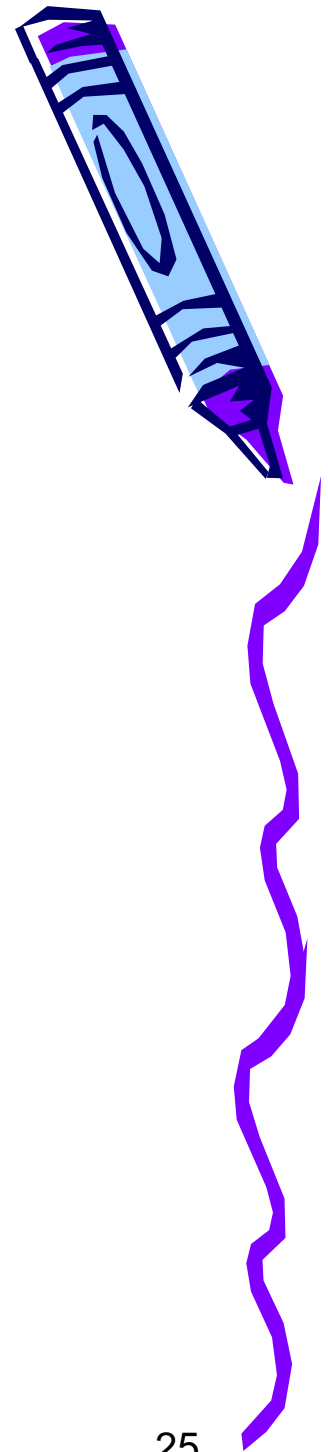


Subject-Verb Disagreement



- Problem: easy to forget what the subject is (singular or plural) when we use long strings of phrases to modify it
- Solution: read the sentence, omitting the modifying phrases, so that subject and verb are together
 - Singular subject uses singular verb.
 - Plural subject uses plural verb.

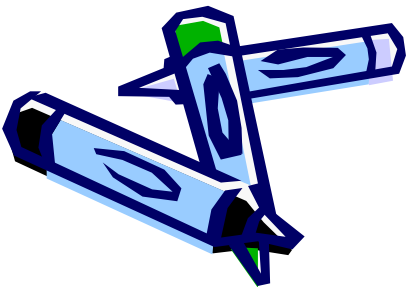




The incidence of basal cell carcinoma and squamous cell carcinoma of the skin (is/are) estimated to exceed one million per year.

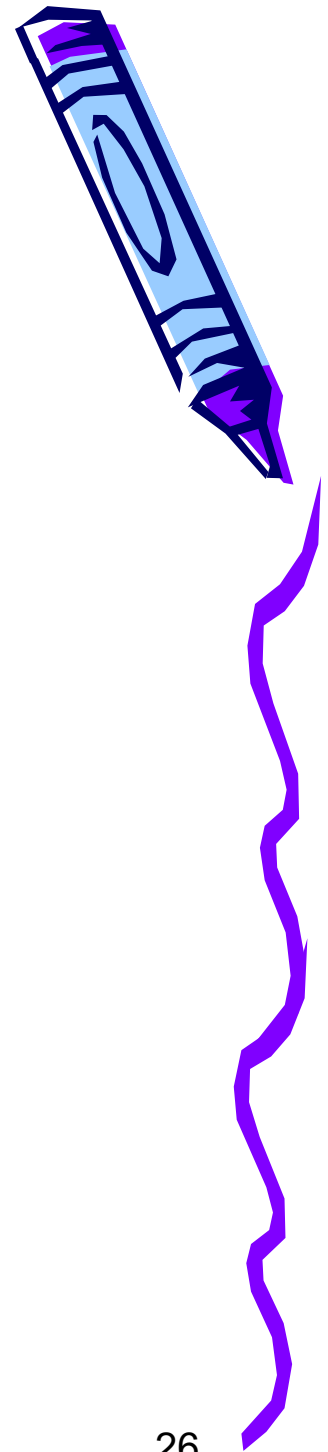
- Subject is *incidence*, singular, therefore use *is*

BUT.....



Basal cell carcinoma and squamous cell carcinoma of the skin are estimated to occur in over one million per year.

Subject is plural: two carcinomas, therefore use *are*



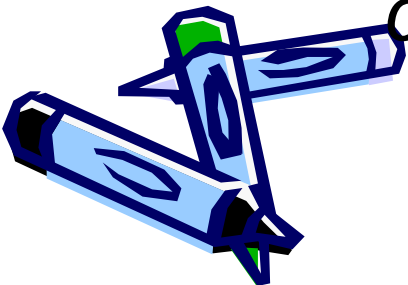


When a subject is made of nouns joined by and, the verb is plural.

*Chocolate **and** ice cream **are** two of my favorite foods.*

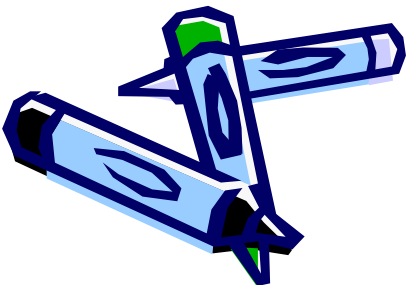
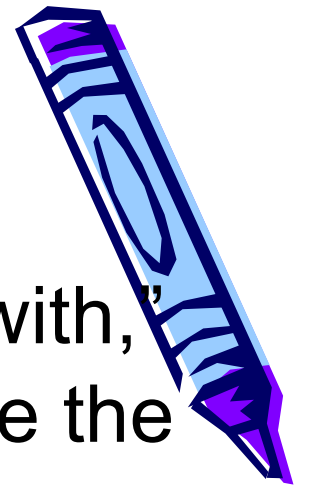
When a subject is made of nouns joined by or, the verb agrees with the last noun.

*The fish **or** the hamburger **is** a good choice.*

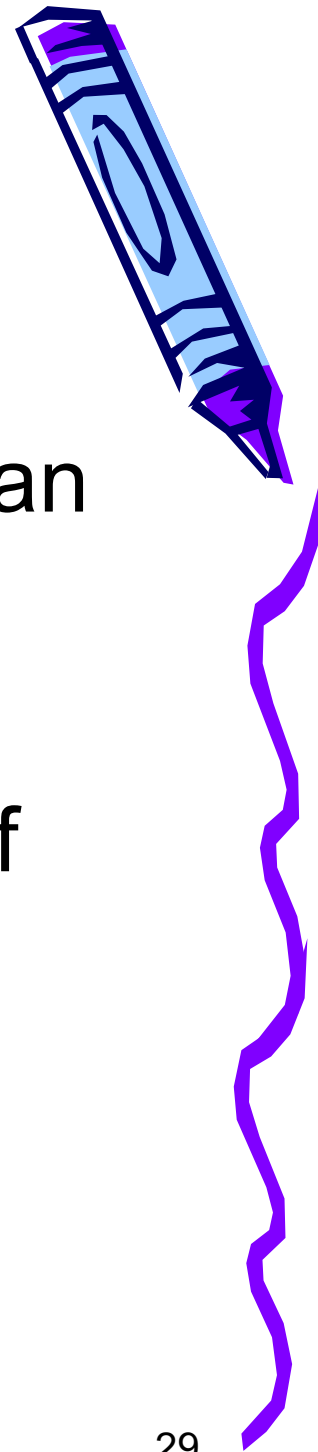


Other singular/plural rules:

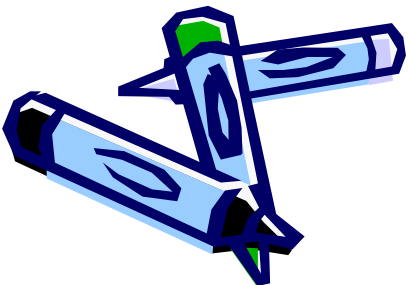
- Phrases such as “as well as,” “together with,” are set off by commas and do not change the number of the subject:
 - *Oil, as well as gas, **is** a good way to heat your home.*
- With money, if the amount is specific, use a singular verb, but if the amount is vague, use a plural verb:
 - *\$200 **is** a lot of money to spend on a pair of shoes.*
 - *Millions of dollars **are** wasted each year.*



Dangling Participles



- Participle: form of verb that acts as an adjective
 - e.g., hanging, trapped
- Dangling when the implied subject of the participle is not the same as the subject of the sentence

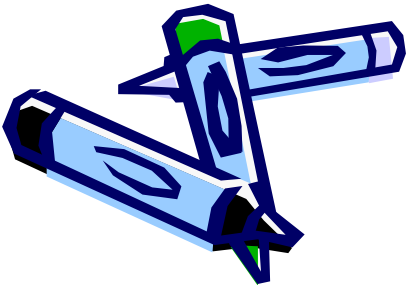
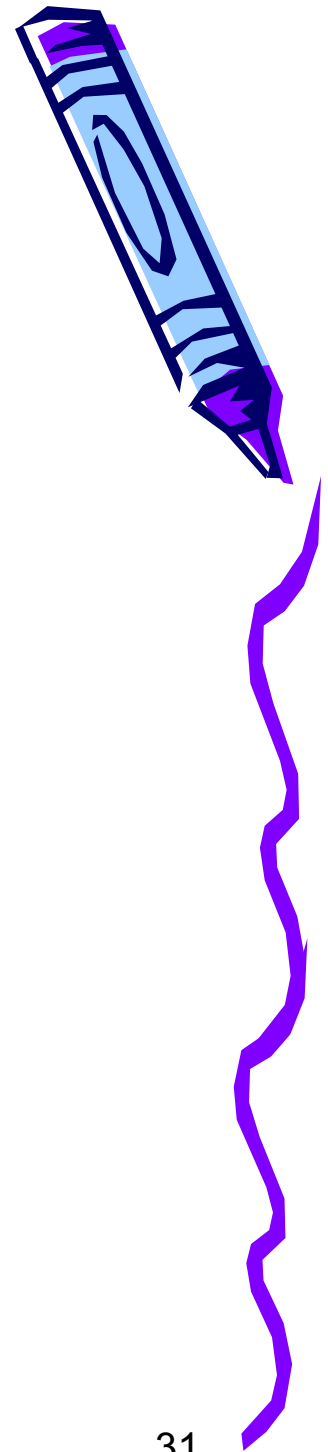




- *Wrapped around the spinal cord, the surgeon found a large tumor.*
- Was the surgeon wrapped around the spinal cord? Or the tumor?
 - Sentence says the surgeon was.
- Change to: *The surgeon found a large tumor wrapped around the spinal cord.*

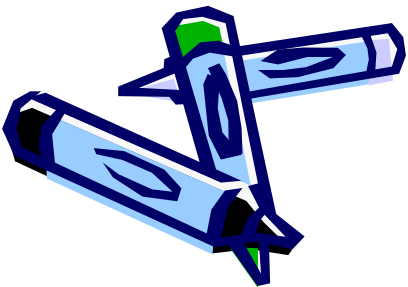
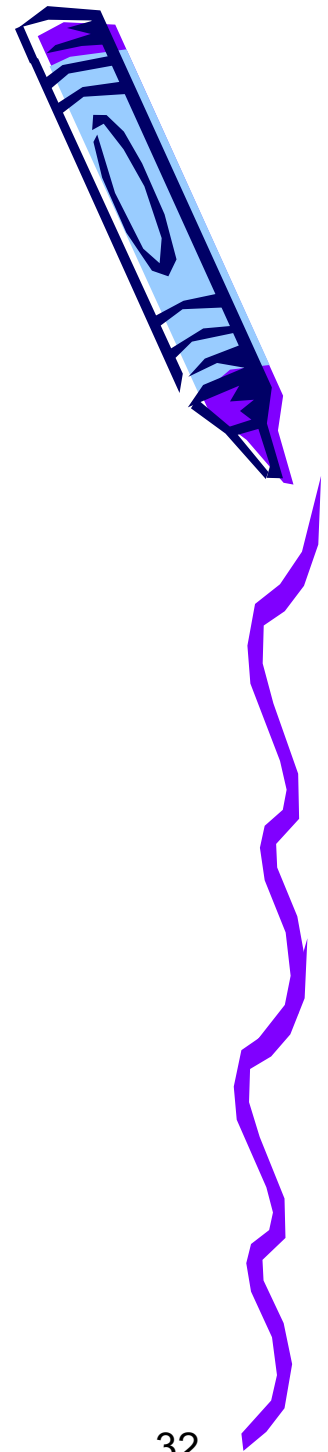


- Dangling participles often occur in passive voice
- Solution: use active voice



Modifiers

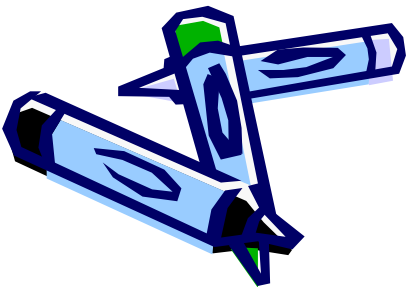
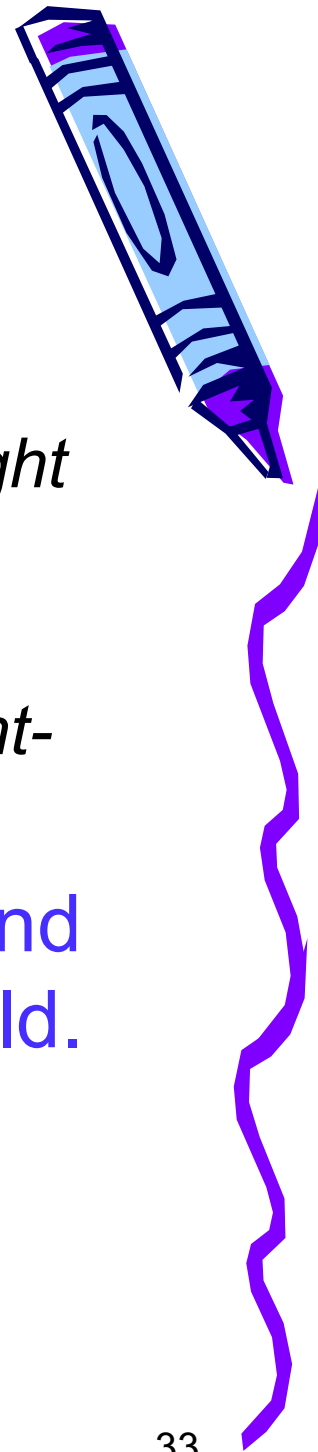
- Too many modifiers in a row
- Stick to only 2 or 3
- Use hyphens for clarification



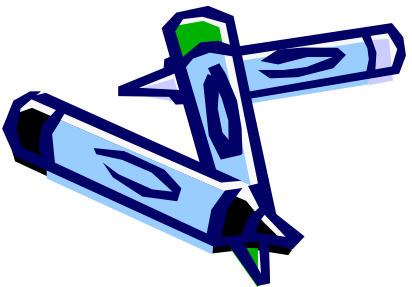
Modifiers

- Original: *Patient B was 57 years old, male, right handed, Caucasian, and was admitted to the hospital with chest pains.*
- Changed to: *Patient B was a 57-year-old, right-handed Caucasian man who was admitted....*

Note the hyphen in 57-year-old (compound adjective) but no hyphen in 57 years old.



Other Grammatical Problems

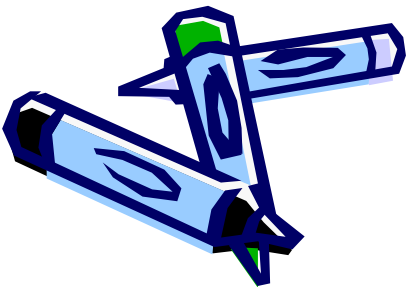


How many mice?

*Histomorphometric analysis of femora from
3 month-old wild-type and knockout mice
showed.....*

- Three wild-type and three knockout mice that were born one month ago? (so 6 mice?)
- Unspecified number of mice that were born 3 months ago in each group ?
- One mouse per group that was born 3 months ago?

This is VERY confusing!!!

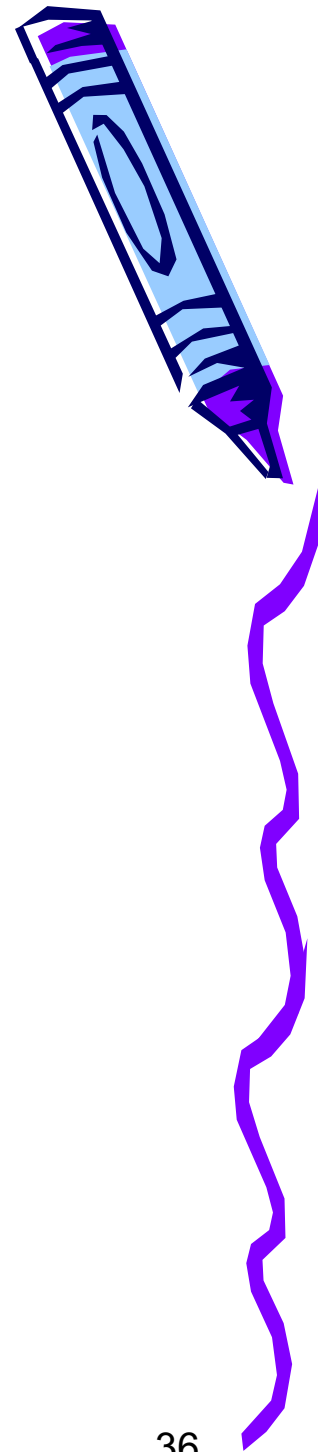


What the author meant:

- Unspecified number of mice that were born 3 months ago in each group

So it should be written as:

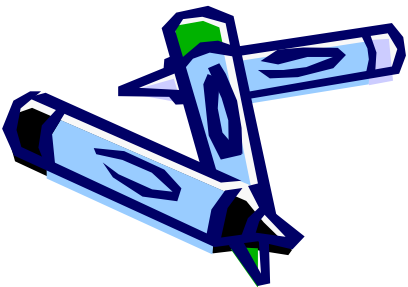
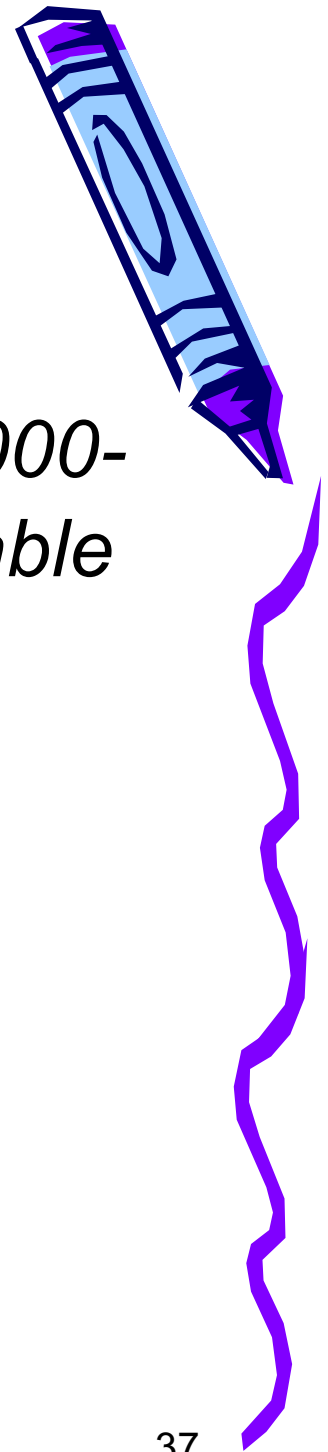
Histomorphometric analysis of femora from 3-month-old wild-type and knockout mice showed.....



How many cells or samples?

For labeling of cells, we assumed that 5000-cell samples contained 1 μg of extractable protein.

- 5000 individual samples?
- Unspecified, but each sample that was extracted contained 5000 cells?



What the author meant:



Unspecified, but each sample that was extracted contained 5000 cells

Probably better to rewrite the sentence as:

For purposes of labeling, we assumed that 1 μg protein could be extracted per 5000-cell sample.

Or...We assumed a yield of 1 μg protein/5000 cells.



And....

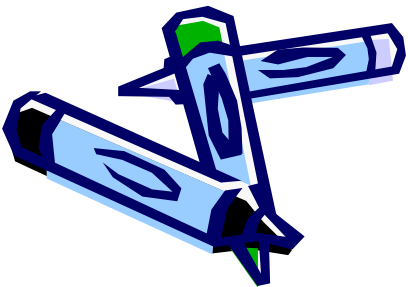


We used a novel mouse model with a miniature repertoire of T cell receptors and high-throughput single cell RT-PCR. Our results show.....

To me, this says that the mouse model has:

- a miniature repertoire of T cell receptors
- high-throughput single-cell RT-PCR

But that is not what the authors meant!!!



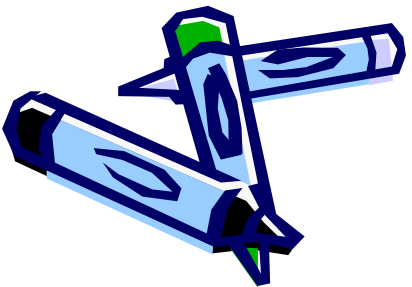
Changed it to.....



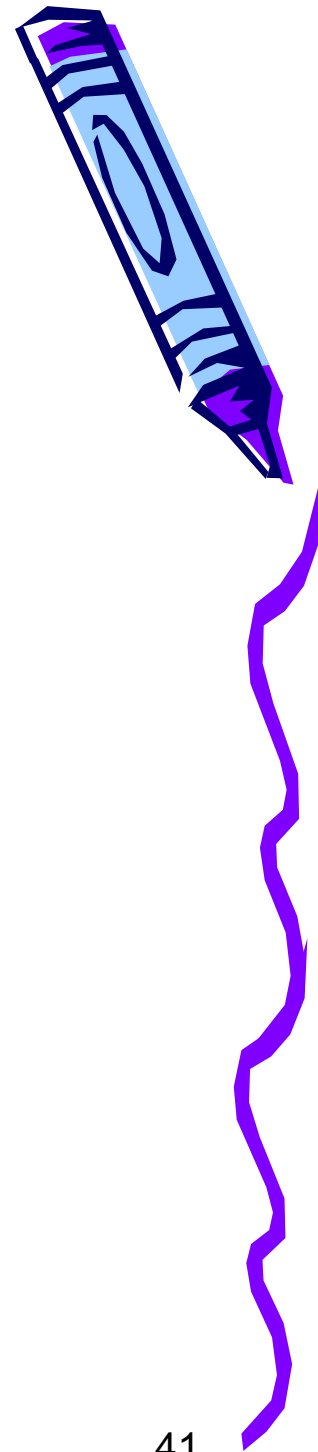
We used a novel mouse model with a miniature repertoire of T cell receptors. Our results from high-throughput single-cell RT-PCR show.....

Or:

Using high-throughput single-cell RT-PCR, we showed that.....



Order of Adjectives



Which of the following is correct?

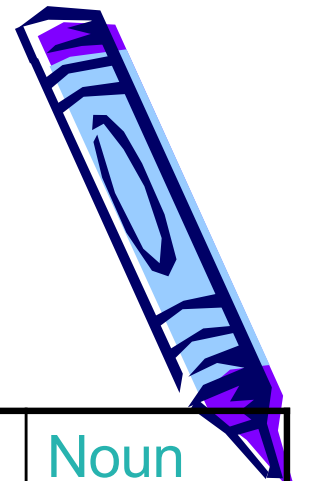
- *There are 21 large green tables in the room.*
- *There are large green 21 tables in the room.*
- *There are green 21 large tables in the room.*
- *There are tables green large 21 in the room.*

Is there a rule to govern this?

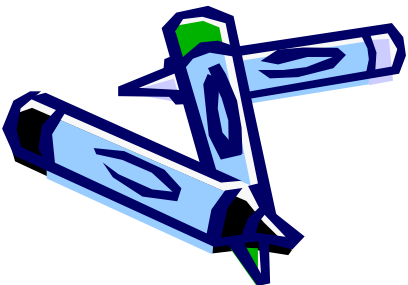
YES!!



Order of Adjectives



Determiner	Quality	Size	Age	Color	Origin	Material	Noun
21		large		green			tables
A	pretty		new			silk	scarf
An	energetic		young		Chinese		post- doc
A	smart, exciting						professor



When to use commas between adjectives.....



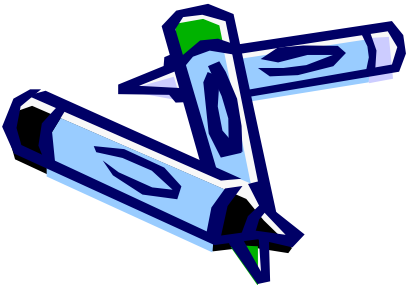
Rule: Use a comma to separate adjectives if two or more adjectives are in the same category.

A smart exciting professor....

Determiner	Quality	Size	Age	Color	Origin	Material	Noun
A	smart, exciting						professor

Since smart and exciting are in the same category, they should be separated by a comma:

A smart, exciting professor.....



Test:



If you can put the word *and* between the adjectives to achieve the meaning you intend, then you should replace the *and* with a comma.

A smart and exciting professor? **YES!!**

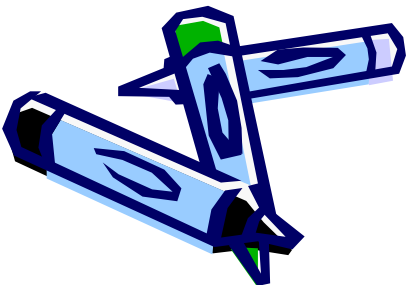
So use a comma.

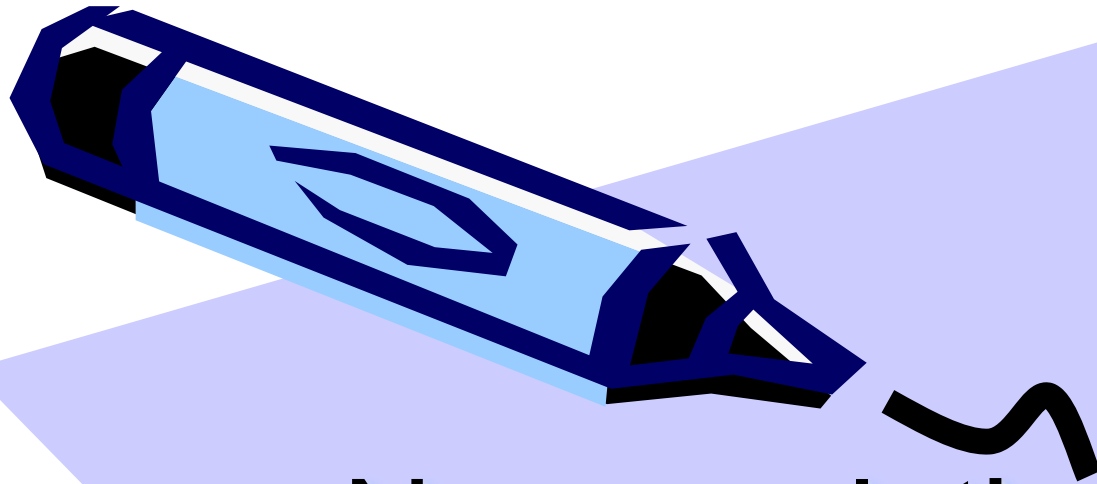
A smart, exciting professor taught the class.

Other examples:

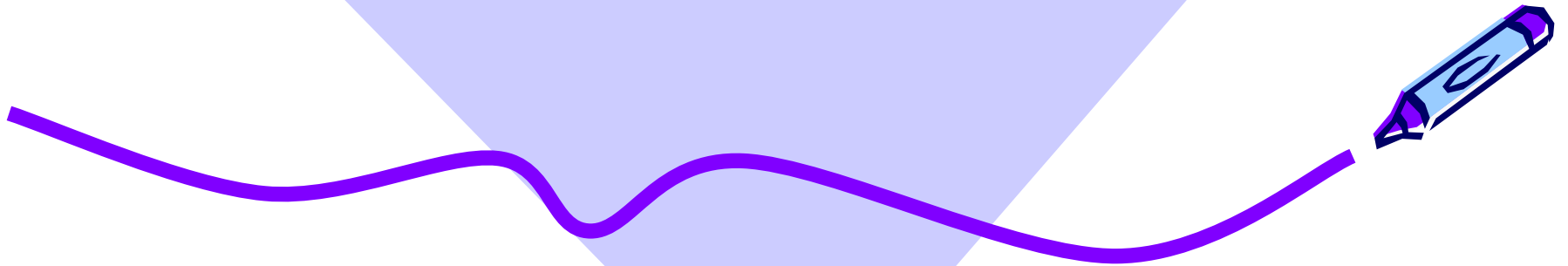
She wore a green, pink, and purple scarf.

She wore a long purple scarf.

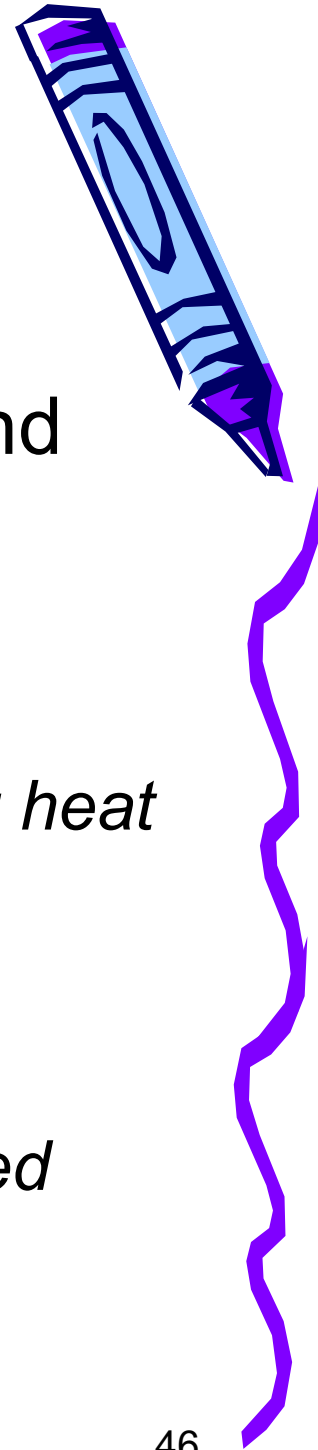




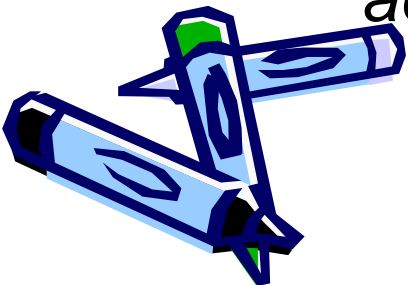
Now.....let's talk about
writing tips specific to
Scientific Writing

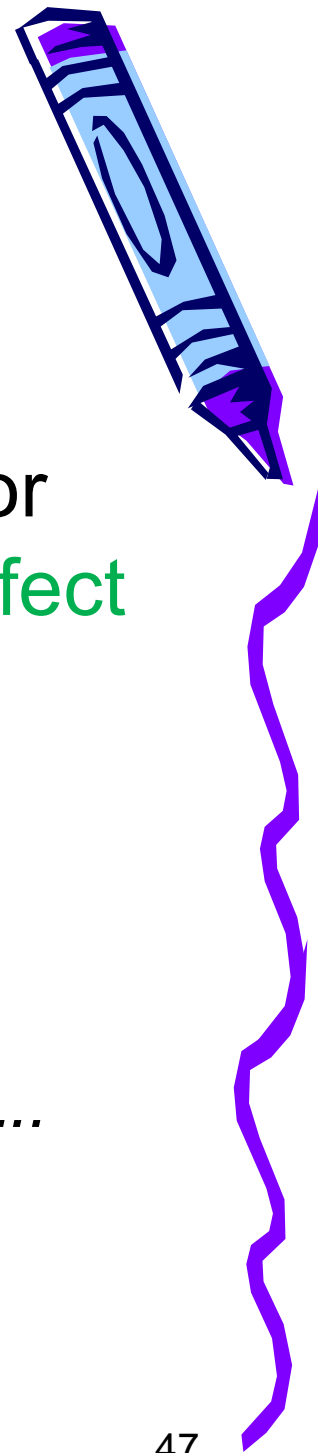


Use of Tenses in Scientific Writing

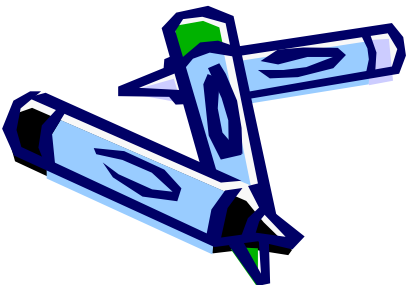


- Different sections of a scientific paper (and grant) use different tenses
- When a fact has been published or is established: use **Present tense**
 - *The principal mechanism of cell death during heat shock **is** apoptosis.*
- If a fact is not generalized or is from a specific experiment: use **Past tense**
 - *The Ala to Phe mutation **resulted** in decreased activity of the enzyme.*



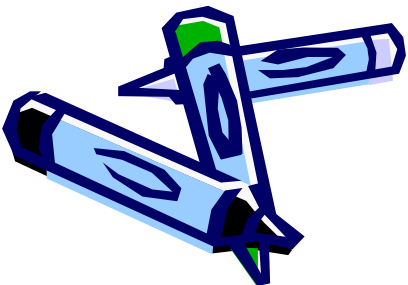
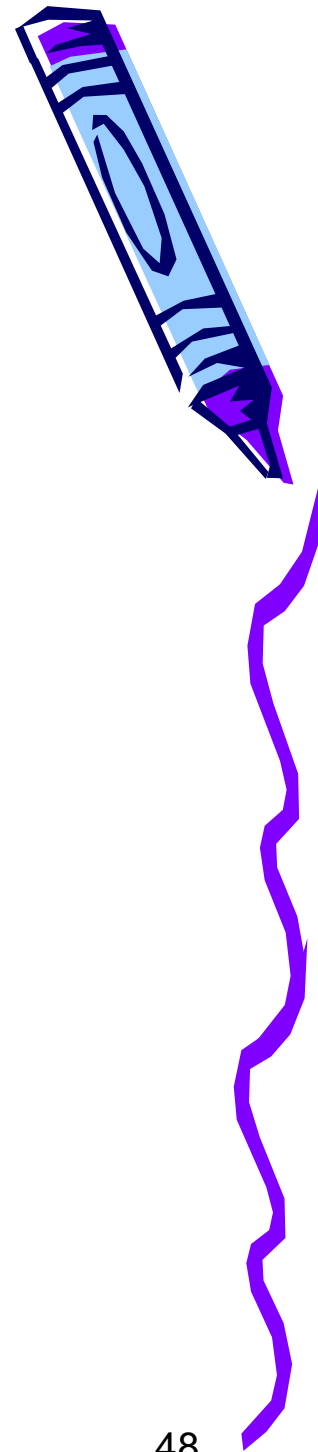


- When observations have been repeated or go from past to present: use **Present Perfect tense**
 - We *have shown* that....
- When referring to figures or tables: use **Present tense**
 - Figure 2 *is* a mass spectrometry analysis of.....

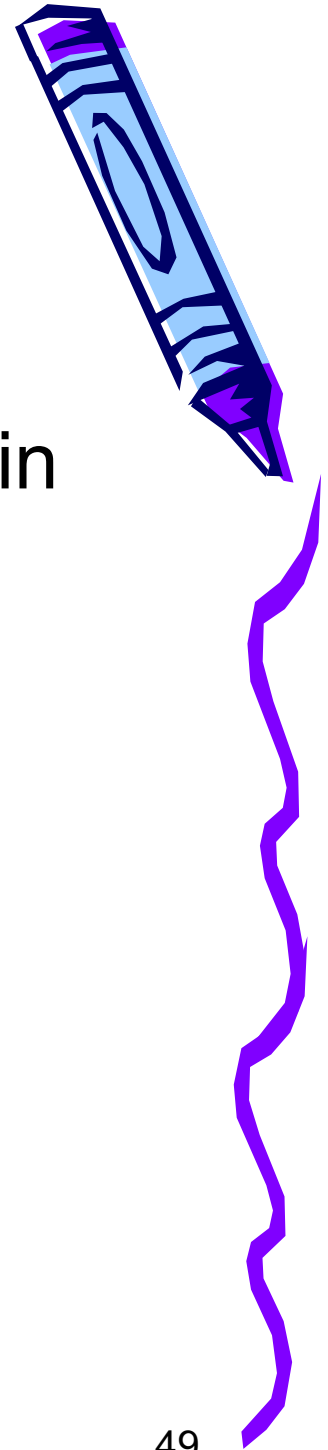


Methods Section

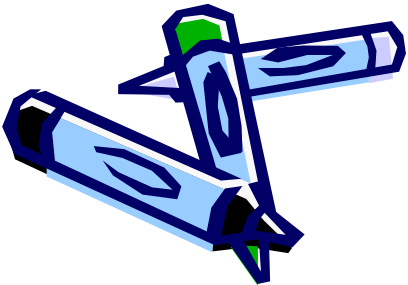
- In a paper: use **Past tense**
 - *GST proteins **were purified** as described.*
- In a grant: use **Future tense**
 - *GST proteins **will be purified** as previously described.*



Person

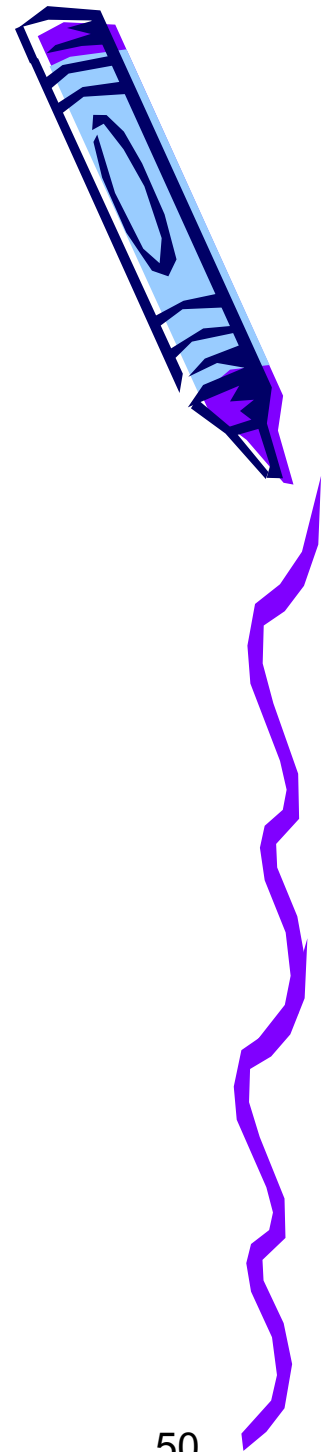


- It is perfectly good to use the first person in scientific writing:
 - *We performed HPLC...*
 - *We and others have shown.....*
- Or the third person:
 - *Jones and colleagues reported that...*

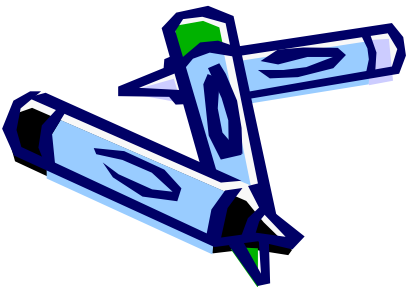


Redundancy

Remove redundancy,
verbosity, and all things
that are repeated!!!



Write clear, logical
sentences



Original sentence from an MCG colleague:



Our preliminary data showed that GILZ inhibits both PPAR γ 2 and C/EBP α transcription, but unlike the inhibition of PPAR γ 2 which involves the direct binding of GILZ to PPAR γ 2 promoter (see appended paper). GILZ does not bind to C/EBP α promoter.

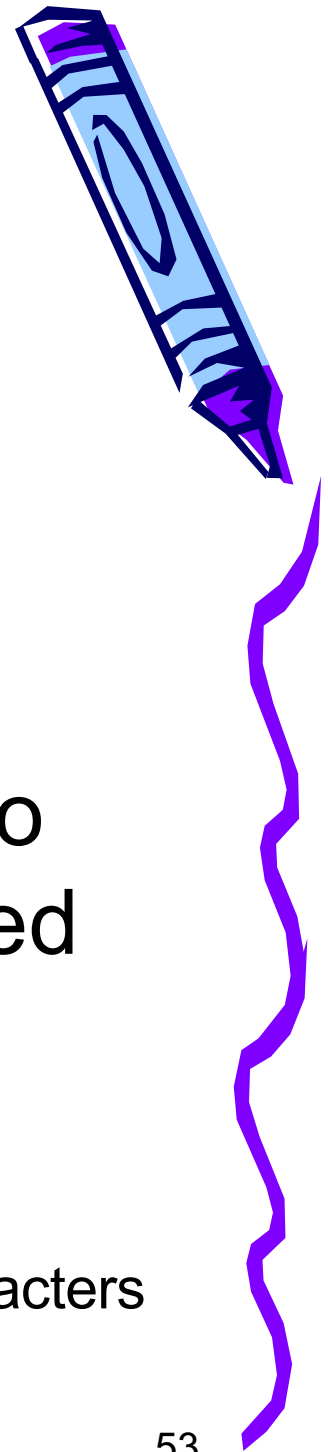
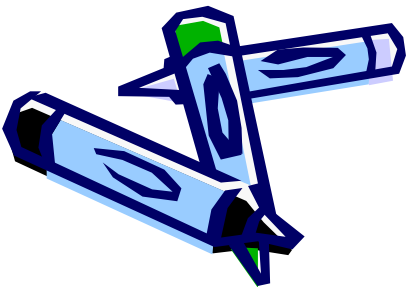
(38 words, 205 characters)

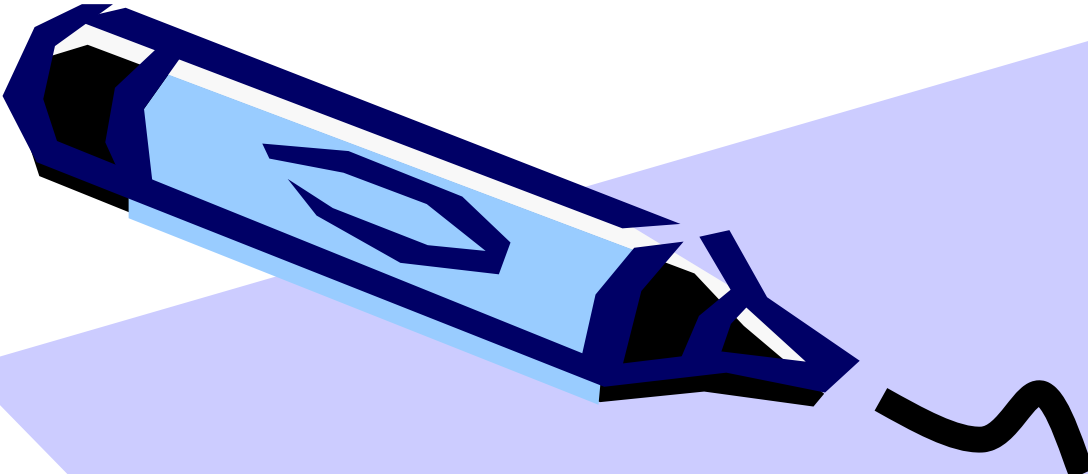


Changed to:

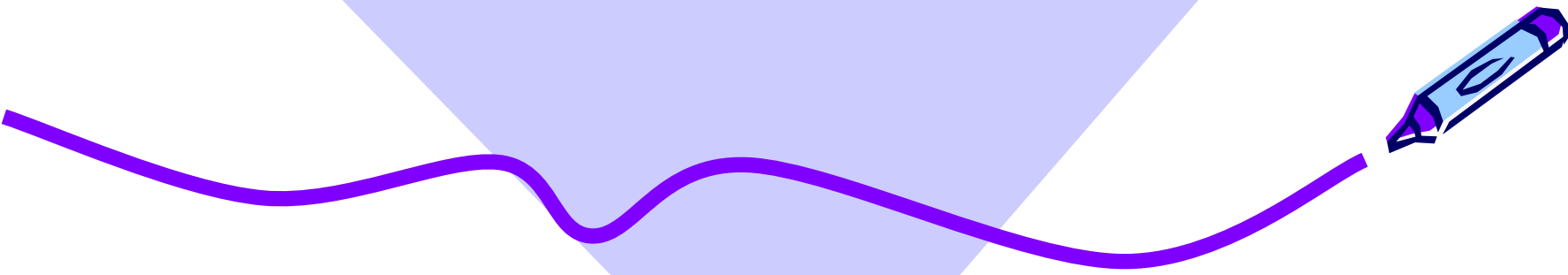
Our preliminary data show that GILZ inhibits both PPAR γ 2 and C/EBP α transcription. However, while GILZ inhibits PPAR γ 2 by directly binding to the PPAR γ 2 promoter (see appended paper), GILZ does not bind to the C/EBP α promoter.

35 words, 193 characters





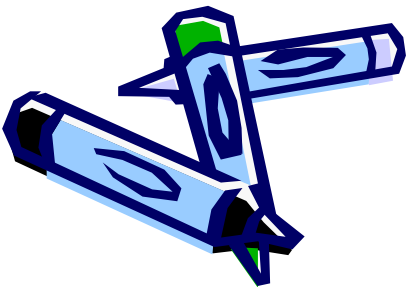
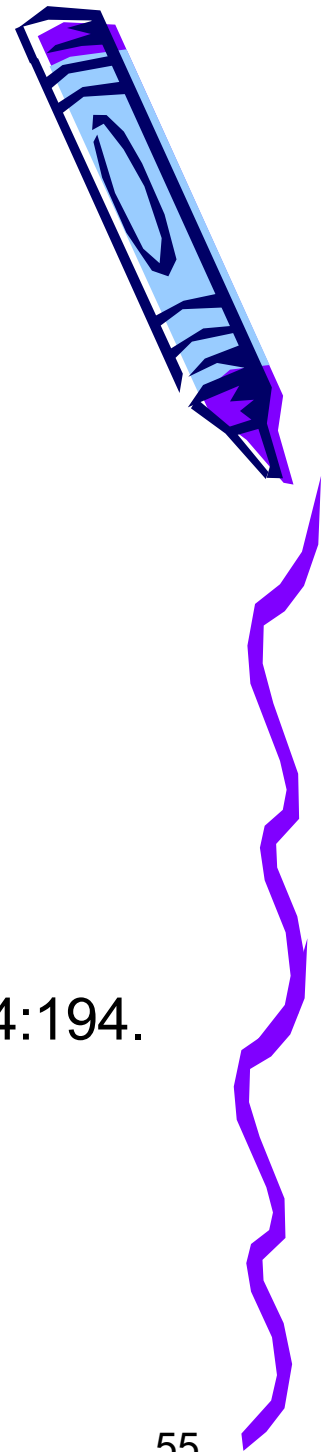
Plain Language in Science



Outdated Attitude

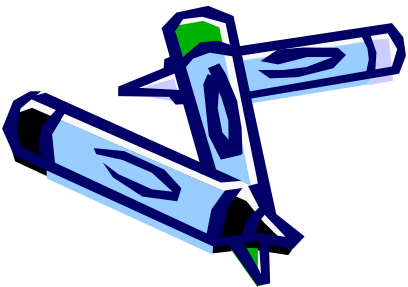
- The importance of the work is inversely proportional to the number of people who can understand it..

Science Editor (2001) 24:194.



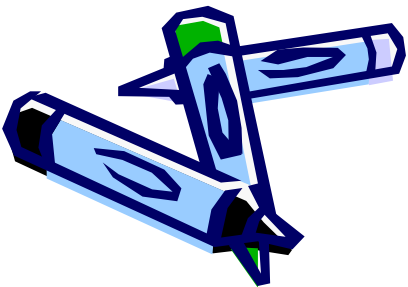
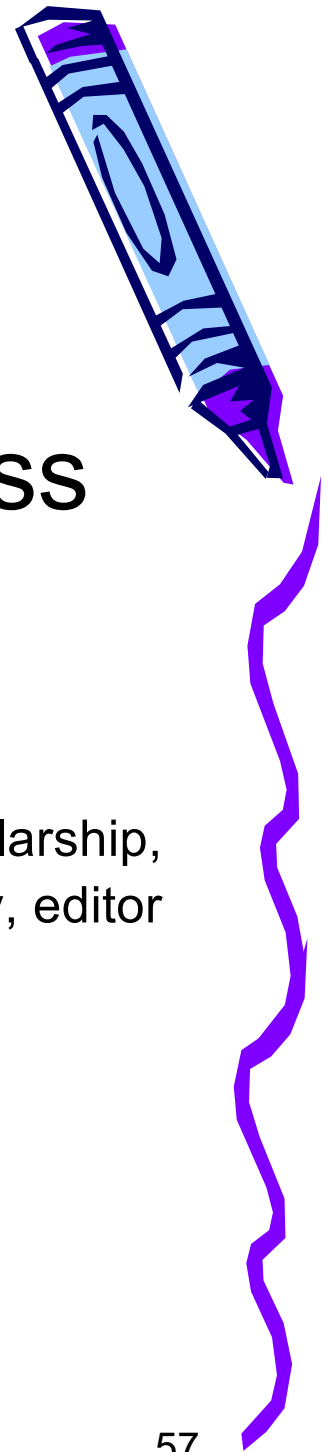


- The trend toward plain language is gathering force in government, academe, and scientific journals.
- If simple words can be used to convey the message, don't use fancy words.

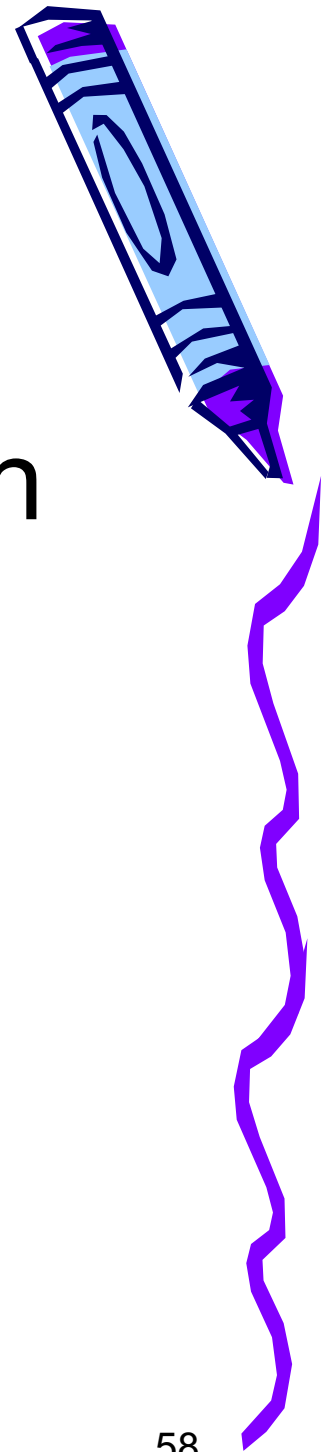


“Choose language not to impress readers, but to inform them.”

Journal of Nursing Scholarship,
“Writing That Matters” by Sue Thomas Hegyvary, editor



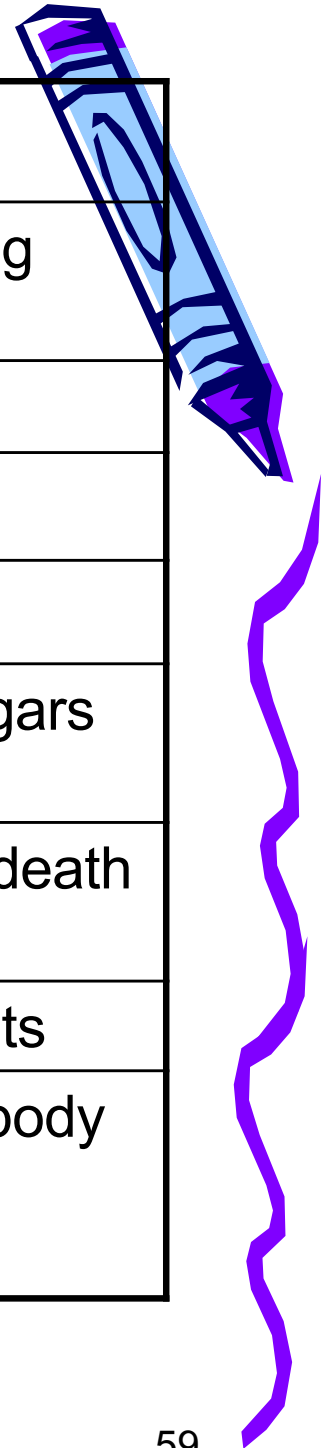
But....be careful....



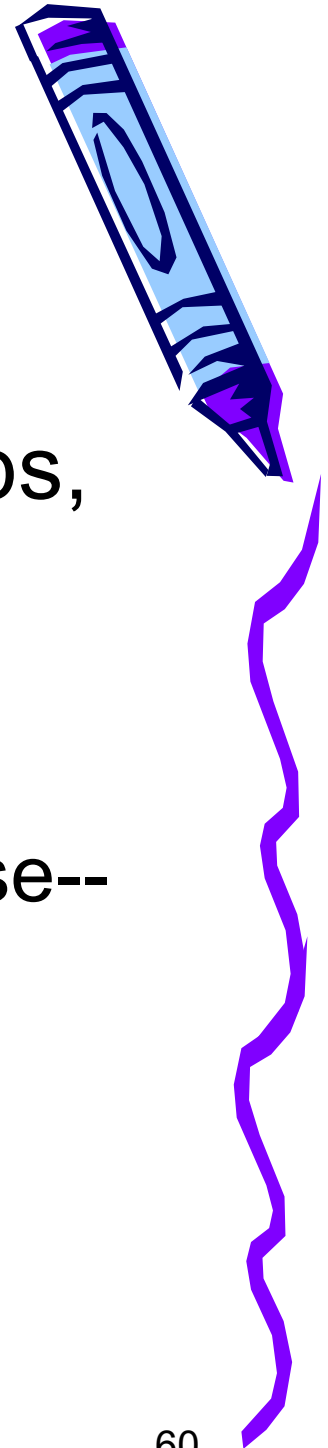
- Do not use informal speech in scientific writing
- Do not use contractions



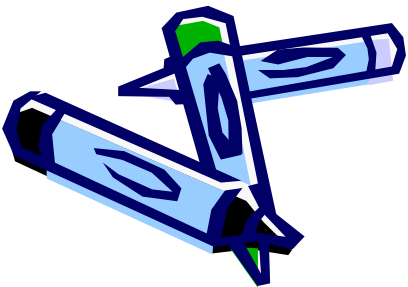
<u>Not</u>	<u>Use instead</u>
We got the following results	We obtained the following results
We got to	We will have to
We can't conclude	We can not conclude
It's still questionable	It is still questionable
Many organisms use sugars like trehalose	Many organisms use sugars such as trehalose
We observed a lot of (great deal of) cell death	We observed much cell death
We plan to confirm our results	We will confirm our results
We used a different antibody as we were unable to distinguish between...	We used a different antibody since we were unable to distinguish between...

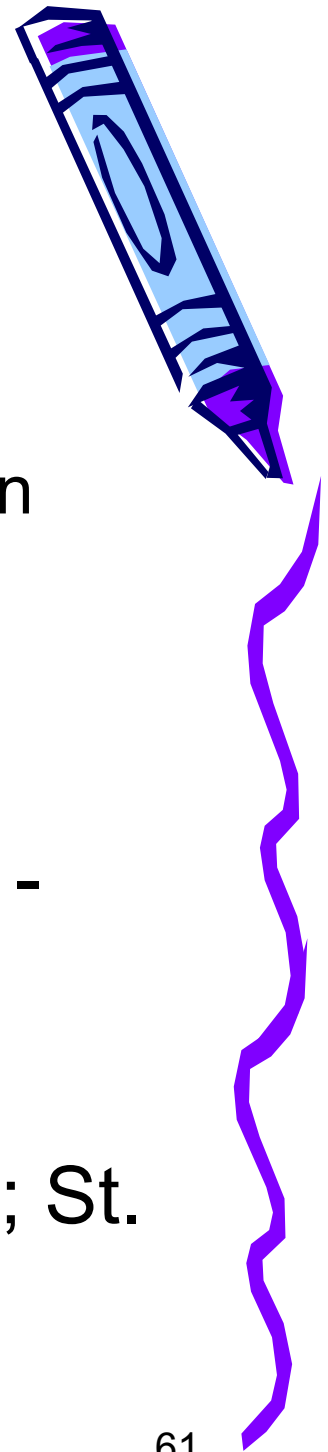


References

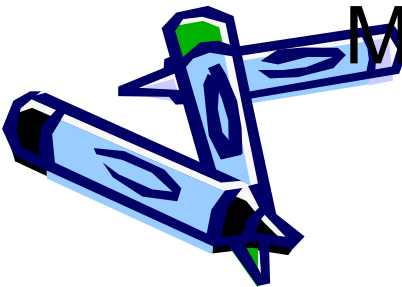


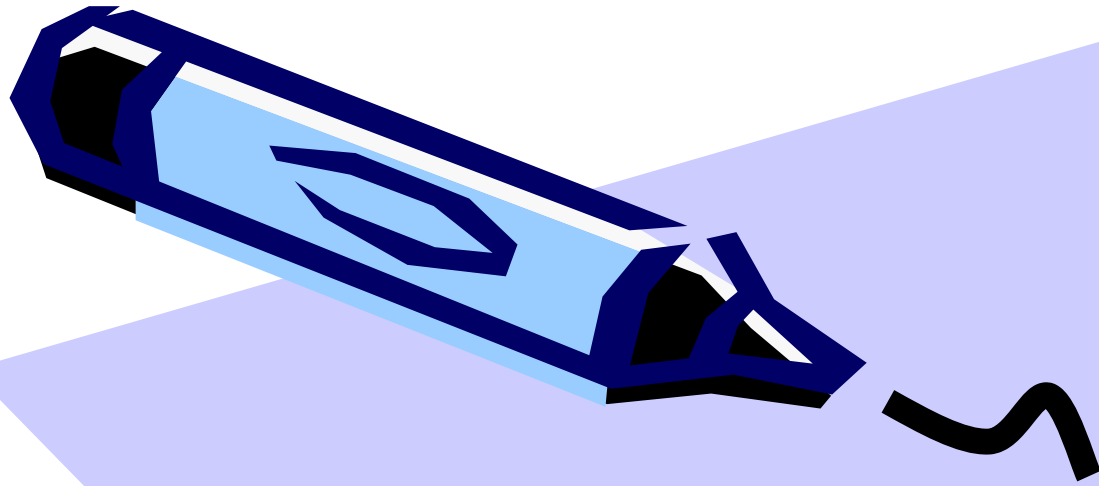
- A Grammar Book for You and I--Oops, Me
 - C. Edward Good, Capital Books, Inc. ISBN1-892123-23-1
 - Also published as: Who's--Oops, Whose--Grammar Book Is This Anyway? MJF Books, ISBN 1-56731-576-3
 - Available from www.amazon.com





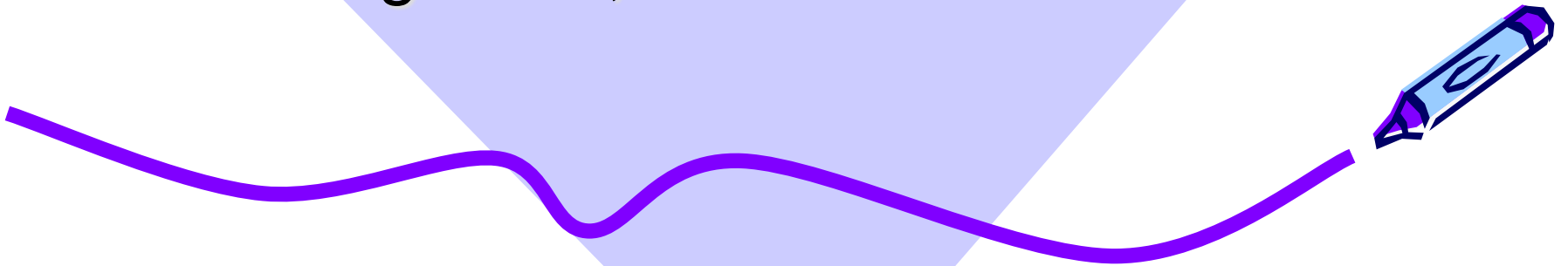
- Eats, Shoots & Leaves
 - Lynne Truss
 - British, so be careful of British vs. American differences in spelling and punctuation
 - Available from www.amazon.com
- Scientific Style and Format
 - Council of Science Editors, ISBN 0-521-47154-0
- Handbook of Technical Writing
 - C.T. Brusaw, G.J. Alred, and W.E. Oliu; St. Martin's Press, ISBN 0-312-16690-7



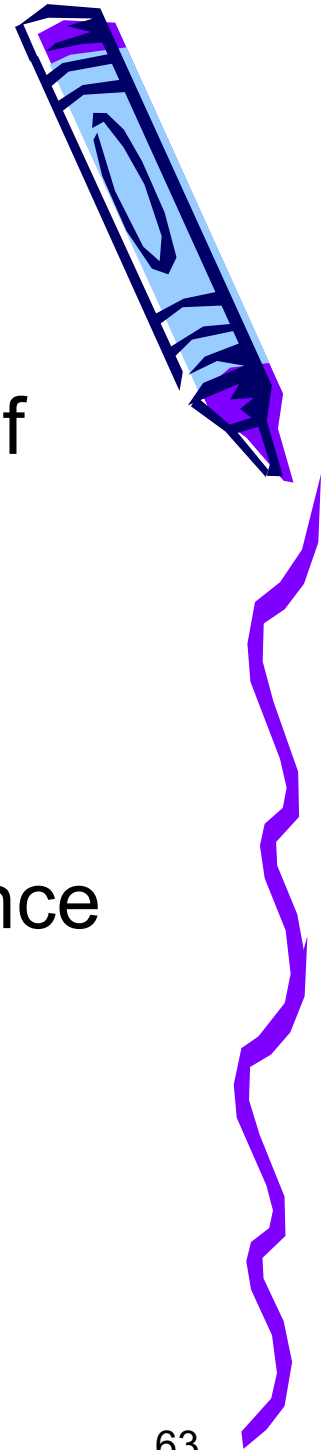


Diagramming Sentences

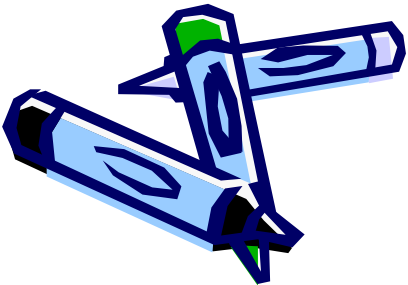
A neglected, but worthwhile tool



Why diagram a sentence?



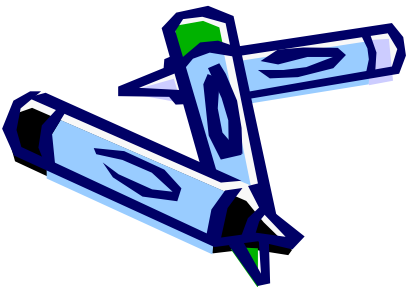
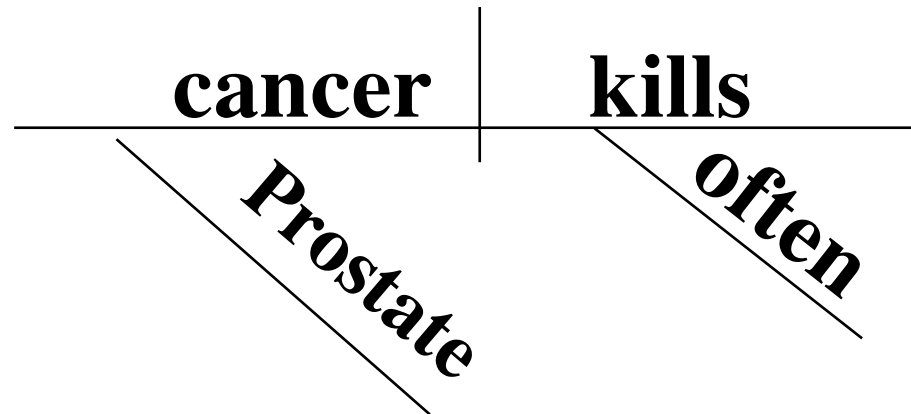
- Diagramming sentences provides a way of picturing the structure of a sentence.
- Puts sentences in basic subject-verb relationship.
- Allows you to see see how the parts fit together and how the meaning of a sentence branches out.
- Gives you a clearer understanding of how sentences work.



A Diagrammed Sentence



Prostate cancer often kills.

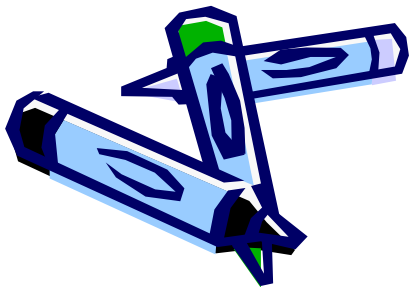


Two Helpful Web Sites

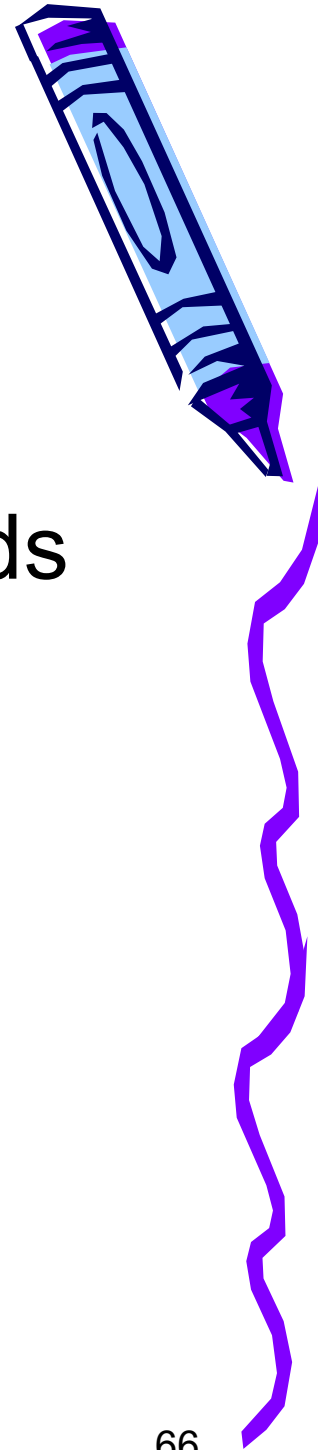


<http://www.lausd.k12.ca.us/lausd/offices/di/Burleson/Lessons/TS/diagram.htm>

<http://www.ccc.commnet.edu/grammar/diagrams/diagrams.htm>



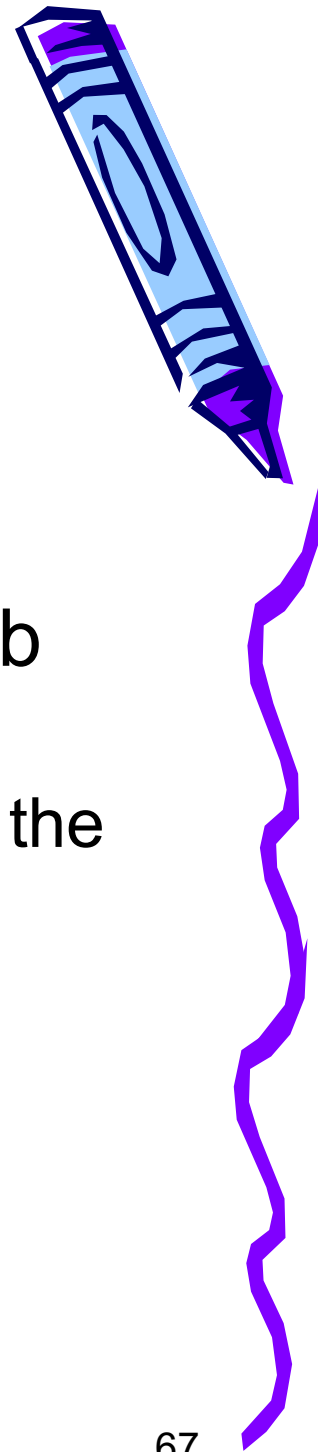
How can we use sentence diagrams to help us?



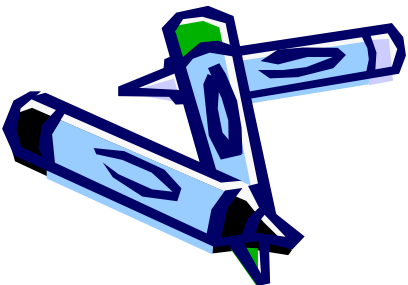
- As you write, think of where the words would be placed in a diagram.
 - What does this phrase modify?
 - Where should it go in the sentence?
 - Will help you avoid using dangling participles.



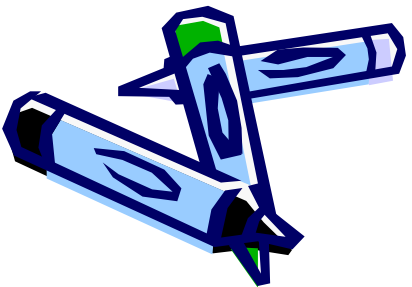
How can we use sentence diagrams to help us?



- Guaranteed to help you avoid subject-verb disagreements.
 - Because you will see the subject right next to the verb!
- If diagram is too clogged, sentence may need simplification.



Tutorial
from the second Web site
listed



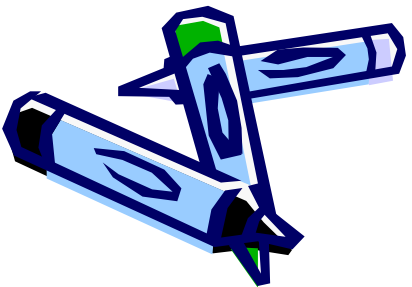
Start with a Simple Sentence

Cancer kills.

We place the subject-verb relationship on a straight horizontal line . . .

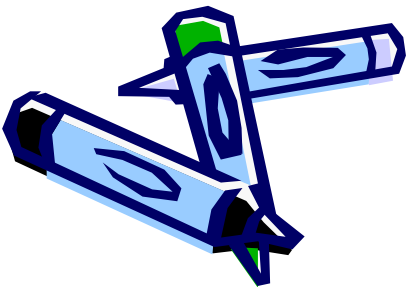
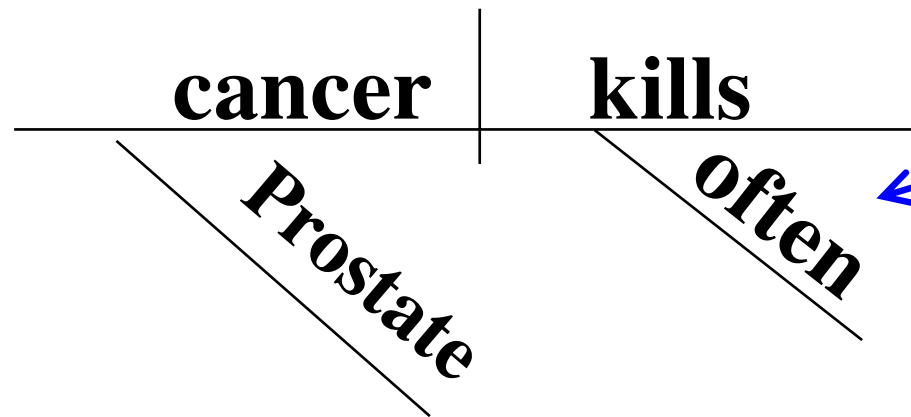
Cancer | kills.

and separate the subject from its verb with a short vertical line extending through the horizontal line.



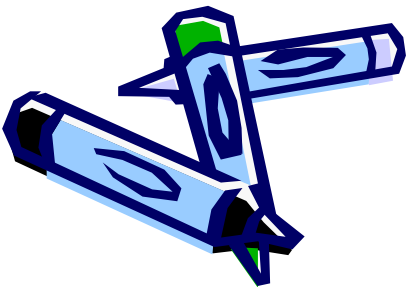
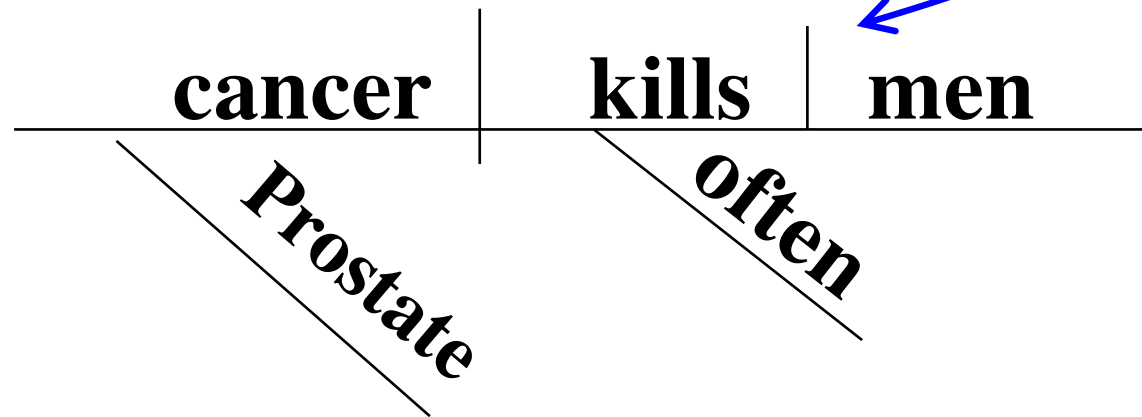
Modifiers (including articles) go under the words they modify on slanted lines.

Prostate cancer often kills.



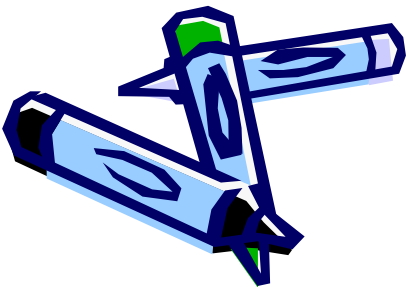
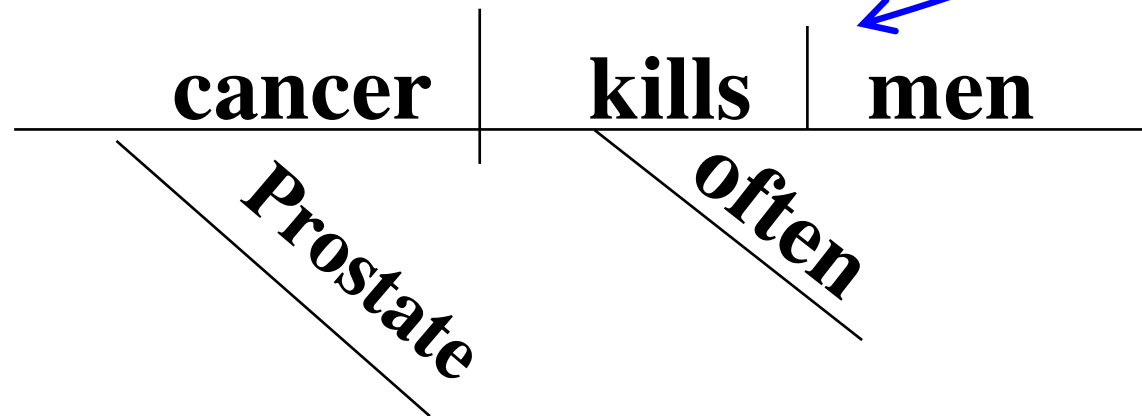
A direct object follows the verb on the horizontal line; it is separated from the verb by a vertical line that does not go through the horizontal line.

Prostate cancer often kills men.



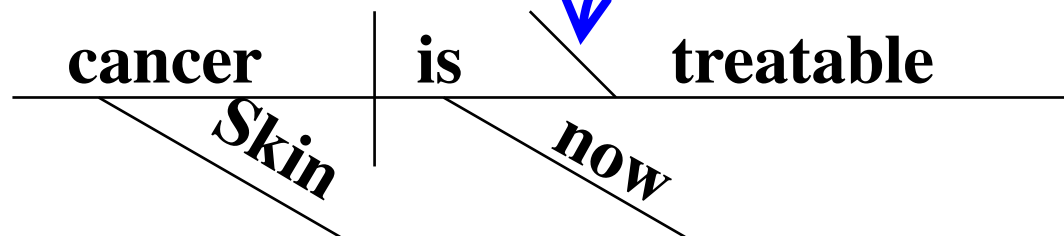
A direct object follows the verb on the horizontal line; it is separated from the verb by a vertical line that does not go through the horizontal line.

Prostate cancer often kills men.

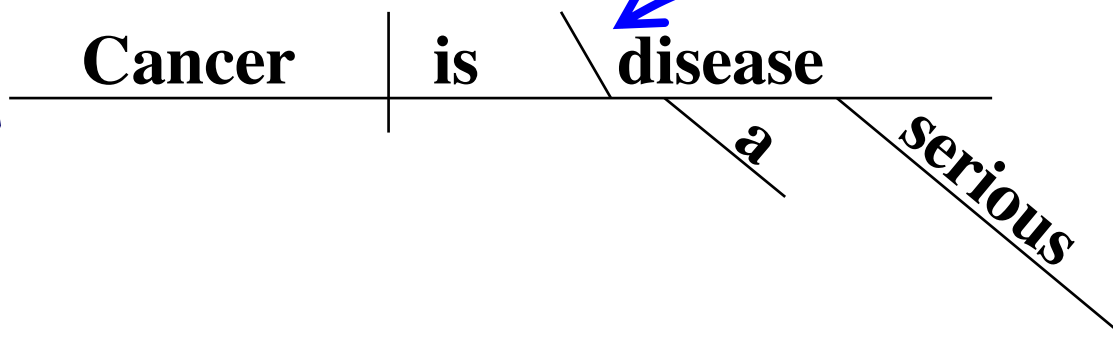


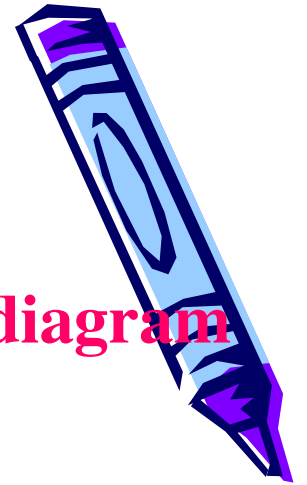
Predicate nouns and predicate adjectives follow the verb & are separated from the verb by a slanted line.

Skin cancer is now treatable.



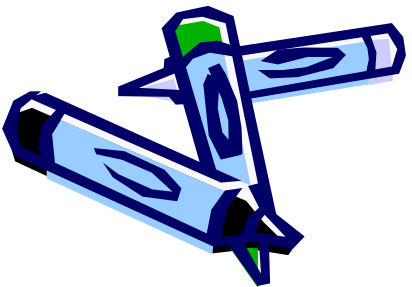
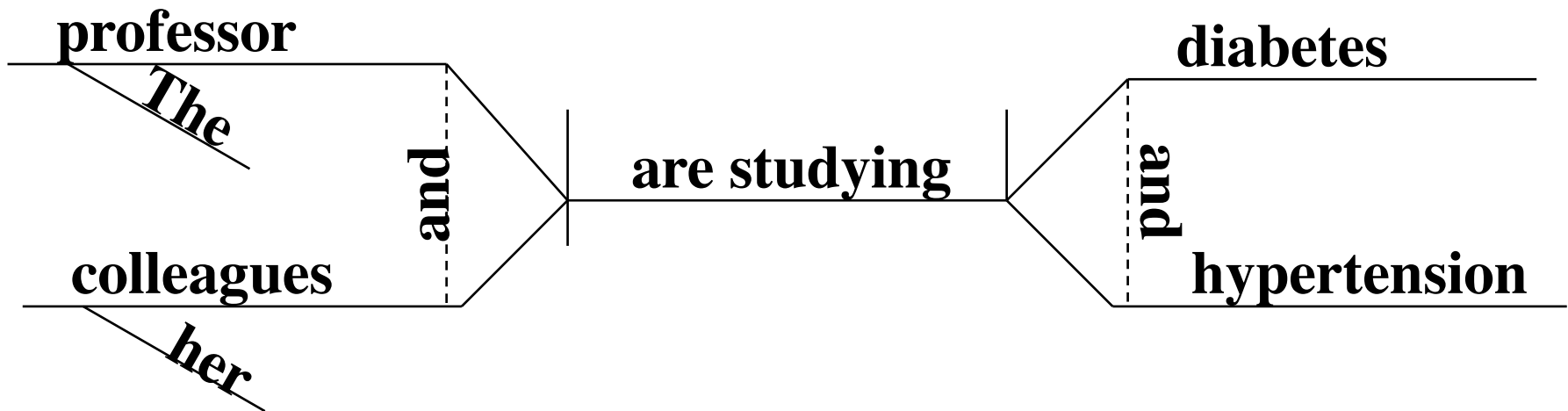
Cancer is a serious disease.





With compound subjects and predicates, the sentence diagram begins to branch out.

The professor and her colleagues are studying diabetes and hypertension.

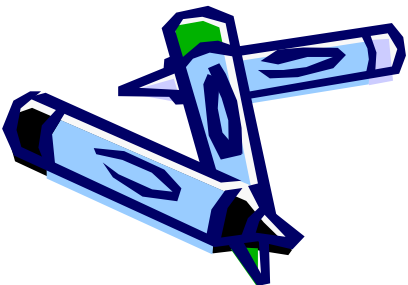
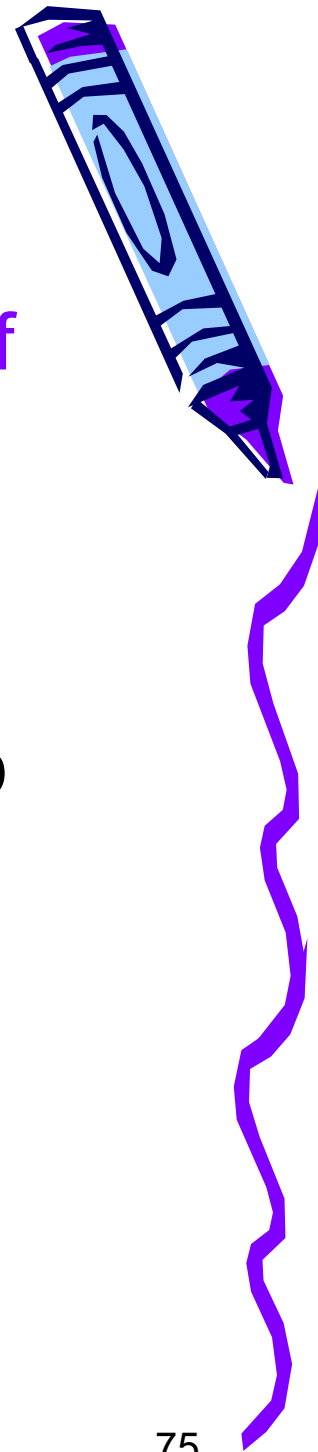


Thank you to....

My colleagues who let me use samples of their writing:

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Steve Hsu, PhD
William Dynan, PhD
Anatolij Horuszko, PhD
Lan Ko, PhD

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Leszek Ignatowicz, PhD
Robert Yu, PhD, MedSciD
Xingming Shi, PhD
Mong-Heng Wang, PhD



Any Questions

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