Today we’ll look at conventions for capitalization and the use of acronyms in technical writing.

The basic rules of capitalization—proper nouns are capitalized and common nouns are not—generally apply in science writing, except for some special cases. (There are always “special cases” in English and physics.) Today, we’ll look at them.
If a proper noun is used as an adjective, it’s always capitalized.

For Hamiltonian and Lagrangian, the “function” is implied but unstated, so the “adjective” rule still applies. These are the only two examples that I’ve been able to think of where a word derived from a proper noun is still capitalized when it’s used as a noun, but there are probably others. (Pesky mathematicians!)

Note that only the proper noun (name) is capitalized in a compound noun; the common noun is written lower case (e.g., Compton scattering)

If you’re not sure whether a word should be capitalized or written lower case, consult a scientific dictionary (I recommend *The Oxford Dictionary for Scientific Writers and Editors*) or the AIP Style Guide, Appendix B, (posted on the course website). You can buy a good used copy of the Oxford for about $10.

An en dash (think of it as a super-hyphen) is used to join two proper nouns to make a combined adjective. We’ll talk more about dashes later in the semester.
Units of measure are capitalized only when they are abbreviated

Examples: watt (W), joule (J), tesla (T), volt (V)

“Powers” follow the same rule
megawatt (MW), terahertz (THz)
mega-electron-volt (MeV)

Note: “kilo” (1000) is never capitalized:
kV, keV, kg, kA, kHz, kΩ, $100k

And—abbreviations for units are always singular
45 mm, 10 GeV, $3.6 \times 10^7$ n s cm

Even though we think (and say) “45 millimeters” when we see “45 mm,” the unit is written as a singular.

And remember, the unit is always abbreviated when it is associated with an exact number (measured or calculated); it is written out as a word only when it refers to an approximate number. Thus: “7 kg” and “a few kilograms”

For more rules on writing numbers, see
http://people.physics.illinois.edu/Celia/Lectures/Numbers.pdf.
In general, common nouns are not capitalized when they’re written out as words, but the abbreviations are ALWAYS capitalized—whether they’re units, elements, or acronyms.

Elements, even those derived from proper names (curium, francium), are always written lower case when they are written out as words. Only the abbreviations are capitalized, and just the first letter of the abbreviation is capitalized.

The notation shown for chemical elements is the convention adopted by the International Union of Pure and Applied Physics in the 1970s. While you’ll see “He-3” written in older papers (and by older authors), use $^3\text{He}$ now.
Particle names are always written lower case
quarks, muons, neutrinos

...even when they are derived from names
fermions, baryons

...except when the proper name is used as an adjective
Higgs boson

Although not used much by physicists, the names of minerals are never capitalized either, e.g., dolomite, diamond, even when derived from a proper name (fosterite, smithsonite).
In these examples, “Einstein’s,” “Newton’s,” “Bose–Einstein,” and “Auger” are capitalized because they are proper nouns (names) used as adjectives.
Protected brand names are capitalized

- tempered glass
- Plexiglas
- epoxy
- Stycast
- simulation software
- Mathematica

The trademark (™) or registered trademark (®) symbol is not necessary; the capitalization alone indicates that the name is a protected trade name.

If used, the trademark and registered trademark symbol appear immediately after the trade name (no spaces) and are superscripted.
Names of academic degrees are written lower case, except when abbreviated

bachelor’s degree (BS or BA)
doctorate (PhD or SciD)

Names of academic disciplines are never capitalized (unless it’s a proper noun)

physics, chemical engineering, Japanese, molecular biology, Scandinavian studies

Names of courses are never capitalized (unless it’s the title of a specific course [has a number])
a physics class, Physics 496

In keeping with current usage, periods are no longer recommended for the abbreviations for academic degrees (more about abbreviations soon).

In general, if a number is associated with the name of something, the resulting compound noun is considered a “title” and is capitalized.
I personally think colons are overused in scientific writing; many times they just provide an excuse for an unwieldy, run-on sentence or title. Colon surgery is highly recommended for such cases.
Ms. P would quibble about this title on general principles, regardless of what is done with the abbreviation. Presumably the “effect” is not “new”—it’s probably been there since the glasses formed, but nobody ever looked before now. A more accurate title would be “Mixed-Alkali Effect Observed in ...”

Some common physics abbreviations are supposed to be written in lower case:
ac (alternating current)
bcc (body-centered-cubic)
cw (continuous-wave)
dc (direct current)
fcc (face-centered-cubic)
ir (infrared)
mp (melting point)
rf (radio-frequency)
rms (root-mean-square)

Consult the AIP Style Guide for a complete list of standard abbreviations.

We’ll talk more about abbreviations and acronyms later today.
There’s no consistency, even among journals published by the same publisher! Just look ‘em up.
Double-check your titles for random capitalization. Either capitalize only the first word of the title (and proper nouns), or capitalize every word except prepositions (e.g., *in, with, from, by*), conjunctions (e.g., *and, or, but*), and articles (*a, an, the*).

Strive for witless consistency.
Editor’s marks for correcting capitalization

In Einstein’s *Theory of General Relativity,... l.c.*

The *hamiltonian* is the operator corresponding to...

Moving right along, now we’ll look at acronyms...

To indicate a word should be written lower case, a technical editor will place a backslash through the offending capital letters and note *l.c.* (lower case) in the margin of the page.

To indicate a word should be capitalized, the editor will place three horizontal lines beneath the letter to be capitalized.
While purists make distinctions among abbreviations, acronyms, and initialisms, we’ll just call them all acronyms for the purposes of this class.
You can make an acronym out of almost anything that functions as a noun or an adjective in a sentence. Generally, a compound noun or adjective-noun phrase must include at least three words to qualify for acronymization. However, you’ll find some common two-word acronyms (e.g., ac, dc, rf) and some acronyms made out of single, very long words (e.g., magnetohydrodynamics [MHD]).

Some acronyms have become so widely used and recognized that they don’t have to be defined at first use, but most do. Consult Oxford, Scientific Style and Format, or the Chicago Manual of Style to be sure.

When it doubt, write it out.
While we’re on the subject, a sentence may not begin with a symbol, chemical formula, equation, or number written in numerals, either.
Three ways to fix this sentence

Orig: “STM topographic images are correlated with X-ray crystallographic data.”

1. Write out “scanning tunneling microscope” again—wordy and redundant

2. Add an article—“The STM topographic images...”

3. Rearrange the sentence—“Topographic images obtained by STM are correlated with X-ray crystallographic data.”

I personally prefer #3, because it emphasizes “topographic images”; the device used is probably of secondary importance.—cme

X-ray or x-ray?? Both are used in US English; just pick one and be consistent. British usage is X-ray.
Most, but not all, acronyms are capitalized. Consult the AIP Style Guide for the list; you’ll find some surprises.

The spelled-out words that the acronym is made from are capitalized or written in lower case, depending on normal capitalization rules. So if the word is a proper noun, it’s capitalized; if the word is a common noun or other part of speech (usually an adjective or adverb), it’s written lower case.
The use of periods (.) in abbreviations is evolving

US usage has been* to put periods after one-word abbreviations (Dr., Ms.) but not after multi-word abbreviations

APS, NASA, LIGO

British usage is just the opposite

Dr, Ms, I.U.P.A.P., N.H.S.

As always, there are exceptions:

H.c., i.d.

*The CBE Manual for Authors, Editors, and Publishers, 6th ed., now recommends no periods, anywhere


The AIP Style Guide, Appendix D, lists the exceptions to the “no periods” rule.
If you’re not sure, look it up.
If you’re sure, look it up anyway. You will learn humility.
You can review the rules for writing numbers at
http://people.physics.illinois.edu/Celia/Lectures/Numbers.pdf.
Select the article (a or an) by the sound of the acronym it precedes

Begins with a vowel sound → an
   an STM

Begins with a consonant sound → a
   a SQUID
   a USDA-approved pesticide

What about Si (???)
   a Si substrate
   a silicon dioxide substrate
   an SiO₂ substrate

How will your reader say the acronym to him- or herself when reading it?
What about acronyms in figure captions?

Figure 4. An image sequence from a dDAC experiment shows the growth of a dendritic ice-VI crystal in response to increasing compression. [1]

Good practice is to define all acronyms in captions, even if they’ve been previously defined in the text.

Remember how scientists read papers. They usually look at the figures and captions before they read the text. Defining the acronym in the caption is particularly important for specialized acronyms that may be unfamiliar to the audience.
To recap...
Write whole words lower case*; capitalize abbreviations
Capitalize proper nouns when used as adjectives
Don’t capitalize particles, theories, physical phenomena, apparatus and techniques*
Define acronyms at first use
Don’t start a sentence with an acronym, symbol, or number written in numerals
Just add an s to make an acronym plural
When in doubt, write it out!

*unless it’s a proper noun (name of a specific person, place, or thing)

NOTES: