PHYS 590: Guide to mid-year presentations and reports

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November 1 & 3, 2022

Report Timeline

- Midyear report draft (Nov 10). From the course syllabus:

Written Report Drafts (Midyear and Final)

Report drafts are due about two weeks before each of the major reports. These drafts, in pdf form, should be sent electronically to your supervisor and the course coordinator for comment/feedback. The drafts are meant to be an opportunity for us to provide you with constructive feedback, so the more complete the draft the more useful our feedback can be. The drafts should include at a minimum a properly formatted skeleton of the paper with section headings, an image, and a point form outline of what you plan to say in each section – this will help you get started with your thinking about the draft contents and ensure you have the formatting tools in place. This is intended to be helpful, and will be graded as either 0 or 1/1. Should you receive 0, the mark will be dropped and the weighting assigned to this component in your overall mark will be added to the corresponding written report.

Report Timeline

- Midyear report (Nov 24). From the course syllabus:

Midyear Report

Midyear reports should be no more than 10 pages in length (including figures and tables). Reports should be formatted in the style of a journal publication, with single line spacing and 12 pt font. Reports should be prepared using a word-processing package that is capable of handling equations, tables, and figures, as necessary (use of LaTeX is recommended; I can provide an introduction if requested).The reports should include an introduction, a literature review, a discussion of methodology, a report of progress to date, and a clear statement of the goals for the coming semester. Students should include (as an appendix and not counted toward the page limit) a timeline for their remaining 590 work. PDF versions of the report should be emailed to me and your supervisor. Further information regarding the report format and assessment, including the grading rubric, will be provided in a class meeting nearer the end of term.

Reports

- The report should be written in the style of a physics journal article, with an abstract, and introduction, sections that make up the body, and a conclusion.
    - An abstract gives a very brief summary of the context of the report and the main conclusions – lets people decide whether to read the full paper. Generally abstracts do not include references, as they are listed sometimes separately from the main paper.
- You should aim to give the background context to, and motivation for, your work; describe (and justify/explain, where appropriate) the approach you are taking and progress to date; and outline your path forward. Your goal should be to covey that you know what you are doing, that you understand the context of your project, that you are driving the project (i.e. "charting your own path" with guidance from your advisor, not just mechanically doing what you are told to do), and that you are on a good path to completing a strong thesis.
- No more than 10 pages including figures. Text should be single spaced and at least 12 pt font. The bibliography and the timeline for winter semester do not count towards either limit. Two-column or single column layout is acceptable.
- Relevant literature/background articles should be properly cited. Either *Physical Review* (references listed by [#]) or *Astrophysical Journal* (references listed by author (year)) type citations may be used.
    - Guidelines (and LaTeX templates) for each are available in the "for authors" section of the publisher's web sites.

Physical Review Style

We present in this article the details of the analyses presented in previous SNO publications [16–18], including the exclusive ν_e and inclusive active neutrino fluxes, a measurement of the ν_e spectrum, the difference in the neutrino fluxes between day and night, and determination of the neutrino mixing parameters. We will concentrate here on the low-energy threshold measurements of Refs. [17,18], which included the first measurements of the total ^{8}B flux, but will describe the differences between these analyses and the high-threshold measurement presented in Ref. [16].

We begin in Sec. II with an overview of the SNO detector and data analysis. In Sec. III we describe the data set used for the measurements made in the initial phase (hereafter Phase I) of SNO using D_2O without additives as the target-detector. Section IV describes the detector model ultimately used both to calibrate the neutrino data and to provide distributions used to fit our data. Section V describes the processing of the data, including all cuts applied, reconstruction of position and direction, and estimations of effective kinetic energy for each event. Section VI details the systematic uncertainties in the model, which translate into uncertainties in the neutrino fluxes. Section VII describes the measurement of backgrounds remaining in the data set, including neutrons from photodisintegration, the tails of low-energy radioactivity, and cosmogenic sources. Section VIII details the methods used to fit for the neutrino rates, and Sec. IX the ingredients that go into normalization of the rates. Sections X and XI present the flux results and results of a search for an asymmetry between the day and night fluxes. Appendix A describes the methods used to calculate mixing parameters from these data, and

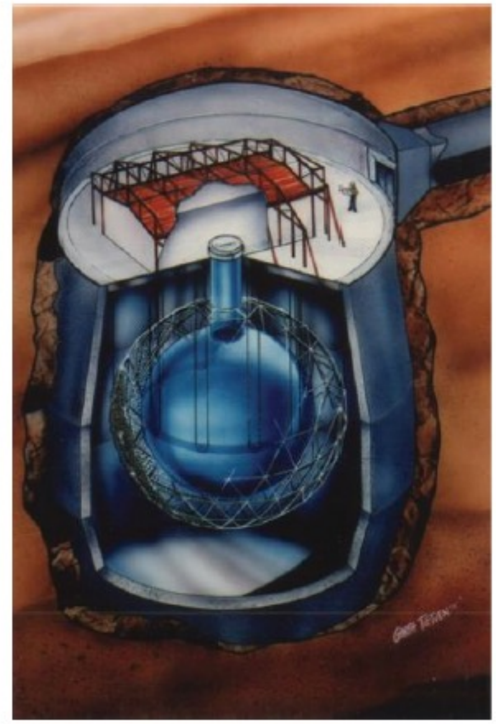

FIG. 1. (Color) Schematic of SNO detector.

shield the heavy water from external radioactive backgrounds: 1.7 kT between the AV and the PMT support sphere, and 5.7 kT between the PMT support sphere and the surrounding

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Astro-physical Journal Style

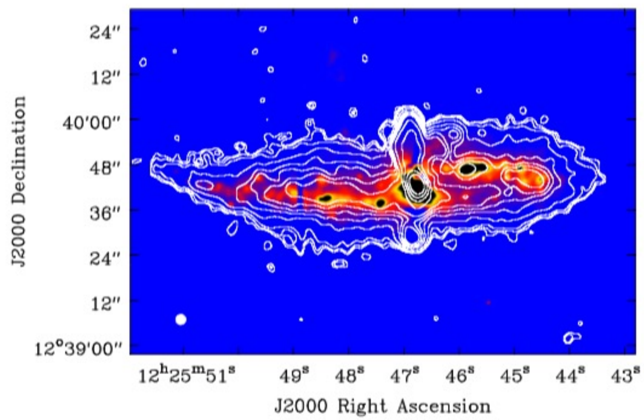

Figure 2. Total intensity contours plotted over the Hα map from Yoshida et al. (2002). Contours are (3, 4, 6, 12, 24, 36, 48, 64, 128, 256, 512, 1024) $\times 3.3\ \mu$Jy beam^{-1}. This map was made with data of C configuration with robust 0 weighting. The resolution of the radio total intensity is $2\farcs76 \times 2\farcs67$, and the rms noise is 3.3 μJy beam^{-1}.

longer parallel to the disk and run along the sharp edge of the total power emission. Vertical magnetic vectors can be seen in the central region along the jet-like structure. All magnetic field vectors outside the high and intermediate surface brightness of total power emission are almost vertical with respect to the galactic disk.

Using the revised equipartition formula by Beck & Krause (2005), we calculated the ordered and total magnetic field strengths from the polarized and total intensities, respectively. We assumed different path lengths and synchrotron spectral

a similar degree of polarization for the SE blob. The uncertainty in p introduces an error in $B_{\rm tot}$ of about 10%.

The intrinsic degree of polarization p_0 in the NW blob may be larger if Faraday depolarization occurs there, possibly by Hα clouds similar to those observed in the northeast by Yoshida et al. (2002). A turbulent field strength $B_{\rm turb} = \sqrt{B_{\rm tot}^2 - B_{\rm ord}^2} \cong 8\ \mu$G, a path length of about 2300 pc (Table 3), and an rms thermal electron density of about 0.35 cm^{-3} in Hα clouds of about 200 pc size and 2×10^{-3} volume filling factor (Yoshida et al. 2002) lead to a dispersion in rotation measure of $\sigma_{\rm RM} \cong 70$ rad m^{-2}. The resulting depolarization at 6 GHz by internal Faraday dispersion (e.g., Sokoloff et al. 1998; Arshakian & Beck 2011) is negligible ($p/p_0 \cong 0.97$). Faraday depolarization by hot gas in the halo of NGC 4388 is even less significant because its electron density is only a few times 10^{-3} cm^{-3} (Wezgowiec et al. 2011).

The strengths of the ordered field obtained from the polarization map are lower limits, since this emission only represents the component of the magnetic vector in the plane of the sky. If the ordered field is inclined by, say, 30° with respect to the line of sight, its strength would increase by 11%.

Figure 5 shows the strengths of the ordered magnetic field obtained from the map of polarized intensities of NGC 4388. The strength of the ordered magnetic field within the disk is comparable to that of other spiral galaxies. The highest ordered field strengths in the extraplanar region are observed in the vertical filaments. It is notable that the magnetic field in the NW and SE blobs is weaker than in the filaments although the polarized intensities are similar. This is due to the different path lengths chosen for each region (see Section 4.2).

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Audience

- The reports (and presentations) should be accessible to an advanced undergraduate physics student, a graduate student, or a faculty member outside the specific subfield of your report. This is especially important for the abstract, introduction, and conclusions. Some of the middle sections may involve more technical material to allow you to highlight your achievements and goals.

- This will probably mean that you will want to include more background material than a typical journal article would. Aim for a report that is self-contained so that the reader is not forced to dig through the references in order to understand it – the references can provide the details, but the key point(s) of the reference should be conveyed in the report. Avoid extraneous material that will distract the reader from the story you are trying to tell – e.g. it is probably not necessary to include every step in a mathematical derivation (if it is particularly important you might include it in an appendix).

- I find that students often worry too much about "boring" their audience. It is important that you save room to highlight your contributions, but even the research experts will appreciate a clear, pedagogical explanation of the topic. Plus, it helps to demonstrate your mastery of the field.

Figures and Tables

- You may wish to (and are encouraged to!) include figures and tables. These count towards the 10 page limit.
- On figures, make sure curves are think enough, and symbols, legends, axis labels, etc are large enough, to be easily read in a printed version (or if shown in a talk). Check the final version to ensure that the image quality was not degraded when embedded in your document and printed to PDF format.
- Figures and Tables should be numbered, and each should be discussed in the text. The caption should give only the essentials of understanding the figure, with discussions of relevance, etc, in the text.
- Include only figures that are central to the story you are trying to tell. There is a balance to be made between wasting space on a figure that is too sparse and having figures that are cluttered and difficult to interpret because they try to do too much.

Grading & Tips

- Your report will be graded by two research experts plus your supervisor.
- Your grade will be based on both content and presentation. Spelling, grammar, organization, and flow are all important.
  - See marking template for additional description of expectations and relative weightings
- There are lots of very good guides to scientific writing available (e.g. Reviews of Modern Physics has a very nice "Guide to Writing a Better Scientific Article" available at https://cdn.journals.aps.org/files/rmpguapa.pdf. Advice about active vs. passive voice, economy of writing, momentum, grammar, title choice, etc.
- The Queen's Writing Centre (https://sass.queensu.ca – go to "book an appointment") can also provide tips, and will read over your draft report and provide (stylistic) feedback

Writing appointments

Undergraduate and graduate students of all faculties, writing proficiencies, and levels of academic achievement at Queen's University use SASS's popular writing service. These **free, confidential** appointments are specific to individual student needs, but commonly include topics such as

- understanding an assignment
- brainstorming ideas
- developing an argument or thesis statement
- organizing main points
- revising a draft
- improving grammar and style
- integrating research

Please **use our online booking system** to book a 25- or 50-minute appointment with a writing consultant (**click here** to book an online appointment). If you have questions about the online booking system, please see **our FAQ tab**.

If possible, book early–our appointments are popular!

Please click **here** for important information about writing appointment policies.

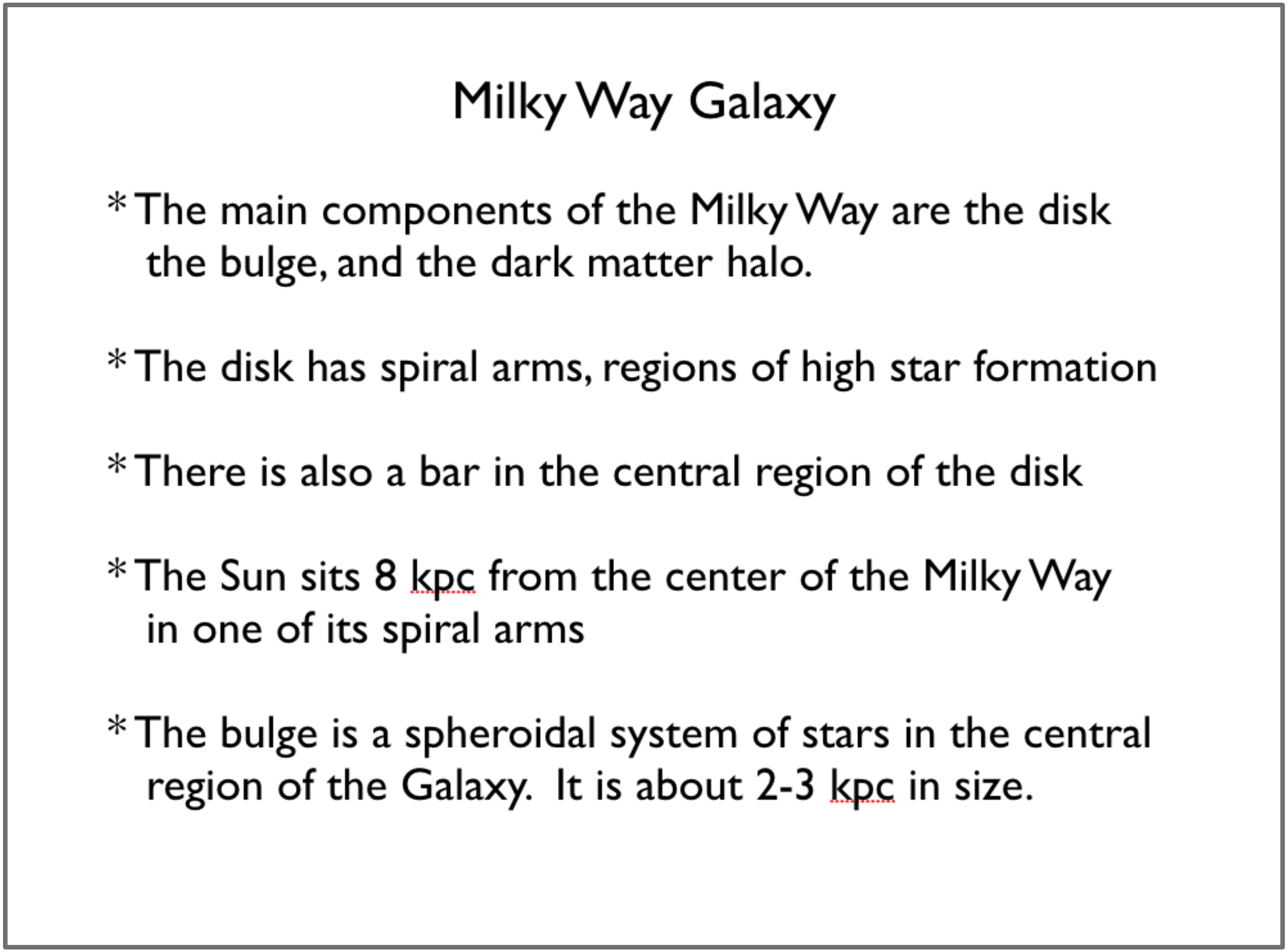
Oral Presentations

- Your talk should follow the same outline as your report, with some key points emphasized.
  - Additional details can be placed in "backup slides" that can be shown if they are needed during questions.
- The presentation marking template is available for reference.
- Oral presentations should be 10 minutes in length, with 10 minutes for questions.
- Your committee consists of your supervisor, two expert examiners, and the 590 coordinator.
  - Presentations are open to all 590 students and other members of the Department, but you do not have to attend all talks.
- Oral presentations will be held in early December
  - I will circulate a poll to determine your availabilities and distribute the schedule in advance.
- You may use your own computer to present if you wish, but please either email me your talk in advance or have it on a memory stick in case of technical issues (I have both PowerPoint and KeyNote, but PDF is safer to avoid scrambled formatting!).

Talk Tips (from Prof. Widrow)

- **Know your audience**: In PHYS590, the audience comprises other physics students and faculty so pitch your talk appropriately. Avoid jargon and do not assume knowledge of background physics particular to your subfield.
- **"Never underestimate the joy people derive from hearing something they already know", attributed to Enrico Fermi**: When possible, bring in physics from the common core (Newton's laws, Maxwell's equations, etc) as you introduce the audience to something new. The flip side to this maxim is that one shouldn't belabour points that are fairly basic or that are not directly related to your talk.
- **Less is more** Don't feel obligated to describe every result from your research, or every step in a derivation. The audience can absorb only so much.
- **Welcome questions, especially when they indicate an audience member is lost or confused**
- **Do not feel obligated to show all of your slides** This points goes together with the previous one. Its better to cover half the material in your talk and have the audience with you, then to lose every one and get to the end.
- **Know your talk well enough to be able to skip less important slides if you're running out of time**
- **Practice** Run through your talk once or twice before the actual event. This will help get the timing right and make for a smoother presentation. The flip side of this maxim is that you shouldn't sound over-rehearsed. Do not memorize your talk.

- Avoid talks that are a series of bullet points. Its generally better to discuss a figure or cartoon than it is to read text from the screen. It takes some practice to develop a clear, well-paced discussion, but it will be more interesting for your audience than simply reading one slide after another.



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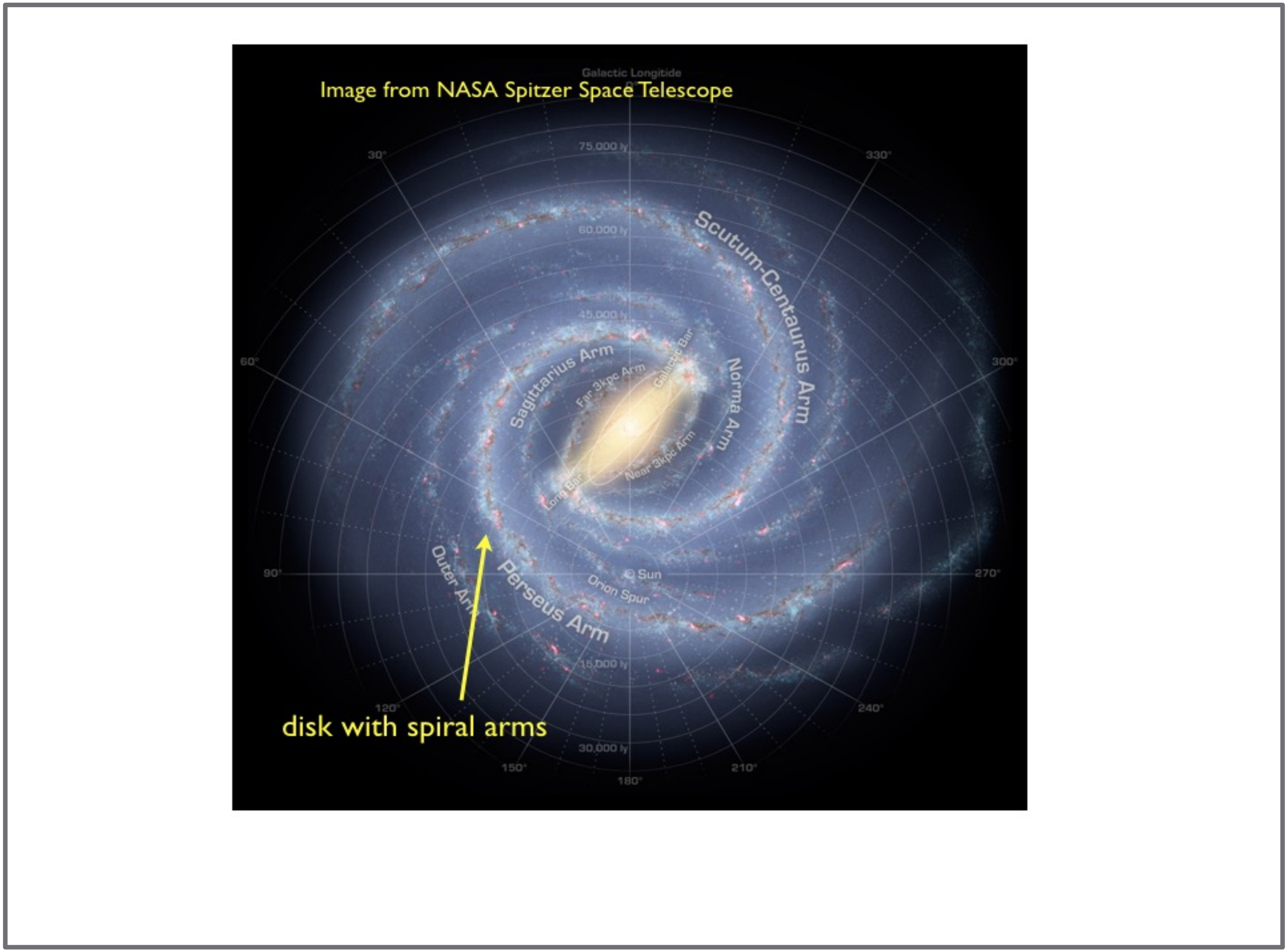

Please

Use

Powerpoint

Gimmicks

Sparingly!