***** BECKER'S *****

ASTRONOMY SURVIVAL NOTEBOOK

The syllabus begins on page vii (7).

Gary A. Becker

Moravian University Astronomy, PHYS-108

www.astronomy.org

T A B L E O F C O N T E N T S

Course Outline: **Page**

TIME

How to stop time: kiss or hug
How to travel in time: read
How to escape time: music
How to feel time: write
How to release time: breathe

The suppression of uncomfortable ideas may be common in religion or in politics, but it is not the path to knowledge. and there is no place for it in the endeavor of science. –Carl Sagan—

When I heard the Learn'd Astronomer

When I heard the learn'd astronomer,
When the proofs, the figures, were ranged in columns before me,
When I was shown the charts and diagrams, to add, divide and measure them,
When I sitting heard the astronomer where he lectured with much applause in the lecture-room,
How soon unaccountable I became tired and sick,
Till rising and gliding out I wander'd off by myself,
In the mystical moist night-air, and from time to time,
Looked up in perfect silence at the stars.

—Walt Whitman— (1819–1892). Leaves of Grass, 1900.

Morning Song

A diamond in the morning
Waked me an hour too soon:
Dawn had taken in the stars
And left the faint white moon.

O white moon, you are lonely,
It is the same with me,
But we have the world to roam over,
Only the lonely are free.

—Sara Teasdale— (1884-1933)

In Astronomy Lab 106

When I sit in the all-scientific Astronomy Lab 106
with long tables and awkward chairs,
When I smell that slightly stringent
smell and hear the throaty thrums
of air conditioners and circulatory systems,
I think of my past college years.
How frightened I was
to think how an English major
fit in with these Ice Station Zebra
surroundings.
Now 48 years later, the sting of GPAs,
the flush of feeling stupid,
the intricate understanding swept away,
I am left with a profound and grateful
spirit that I had the experience,
that I had survived it, and that I
now wish it wasn't all over.

—Susanna— (June 2, 2018)
written in Room 106, Collier Hall of Science…

"Oh gravity, thou art a heartless bitch."
—Dr. Sheldon Cooper, ***Big Bang Theory***, CBS—

Moravian University Astronomy—Spring Term 2026

Tues./Thurs. (PHYS-108 PM), 6:00 p.m. to 9:00 p.m.

Instructor: Gary A. Becker; **Phones: Cell-610-390-1893 /** Moravian Office-610-861-1476
Office: 113 Collier—**Student Hours:** Rm. 106, Tues/Thurs 5:30 p.m. by appointment or **after class**. The office is located on the first floor (basement), middle of the hall, on the Main Street side of Collier.
Email: beckerg@moravian.edu All University related communications should occur with this email.
Web Page: Moravian University Astronomy, www.astronomy.org
Moravian astronomy classes meet in the Astronomy/Geology Lab, Room 106. Facing the HUB, Rm 106 is located on the right side of the first floor (basement) of the Collier Hall of Science. It is marked as the Astronomy/Geology Lab.
Required Texts: ***Becker's Astronomy Survival Notebook*** **(BASN)** is available online, here, for free. Additional articles can also be found online included with the appropriate chapter (sessions) of the book. **Students will also receive a Lab Manual for free.**
Computers: You may have your computers visible during class, but with their lids closed unless they are required for use by your instructor. iPads will be turned off.
Smart Phones: Please turn them off.
About this Syllabus: Consider this syllabus an evolving or working document that helps to keep you and your instructor on track. A working document implies that **there may be changes**. Be more aware of the order of the presentations than the dates associated with the specific lessons. Weekly work will be sent via CANVAS in the announcement and in the assignment sections. Assignment due dates will reflect the current content of the material being discussed and may deviate from the syllabus dates.
The views and opinions that may be expressed in this syllabus are solely my own and do not necessarily reflect the official position or views of Moravian University.

PHYS-108 Syllabus

Your Portal to completing successfully Moravian University Astronomy
www.astronomy.org

Astronomy Class/Basic Information and Syllabus

HERE ARE SOME GENERAL PROCEEDURES FOR CLASSROOM OPERATIONS.

- **Everything you need to complete this class successfully can be found at this link of my homepage, https://www.astronomy.org/moravian/index.html.**
- **Computers: You may have your computers visible during class, but with their lids closed unless they are required for use by your instructor. Turn off iPads.**
- **Smart Phones: Please turn them off.**
- **Arrive in class on time:** 6:00 p.m. at the latest… **Class runs from 6-9 p.m.**
- **Class times will be changed during the unit on Instrumentation:** Most likely those times will be 6:30-9:30 p.m.

- **Do not complete exercises in your Lab Manual unless assigned.**
- **Homework is to be completed on the assigned date and submitted in person.** If ill, have someone designated to hand in the homework for you and provide information to you about missed work.
- **You are expected to present a valid excuse after you return from an absence or inform your instructor before class, via email, or text (610-390-1893) that you will be absent from class.** Otherwise, your absence will be considered unexcused. There are penalties for unexcused absences. See the *Student Information/Syllabus/Class Routine* section of ***Becker's Astronomy Survival Notebook.***
- **Not Feeling well, but well enough to come to class**: **Please wear a mask** to protect your neighbors. It may be appropriate to sit in the back of the room. **I have clean masks available** if you do not have one within easy reach.
- **No Food or Snacks in Class** unless you can provide a doctor's note or communications from the Health Center that it is a medical necessity. **You may bring a nonalcoholic beverage of your choice. If for some reason it is impossible to obtain a meal before class and be on time for instruction, then bring that meal to class.**
- **Classes will be taught without breaks.** If a class goes beyond the period limit, compensation will occur with a free night if 160 minutes of time is accumulated. I will operate on s 50-minute hour.
- **Pick someone in class to act as a lifeline** so that you can work together to complete assignments, study, and take exams. I will be establishing teams early in the semester, but a lifeline partner can be anyone in class, on or not on your team.
- **My workdays are Mondays through Thursdays**: Respect the time that I will need to prepare for the next week's lesson and for me to have some downtime too! I enjoy speaking with people on my cell phone, 610-390-1893, rather than writing long emails.

Week Zero—BEGIN NOW—PACE YOURSELF: About ten hours of work:

- The **FOCUS will be on your ability to follow instructions, neatness, and getting prepared from home for a smooth start to the semester.** Begin preparing now to avoid being overwhelmed when starting this class. I guarantee your efforts to begin the semester smoothly will reduce your stress levels during the first weeks of astronomy classes and school in general.
- **ASSIGNMENTS: Due date for all Week Zero assignments is on the first Tuesday of class.**
    - **Digest the information** in the Student Info./Syllabus/Class Routine sections, starting on page XXV (25).
    - **Complete the** Student Data Sheet in the Student Information Section. Submit this document, signed, on the first evening of class. You will be introducing yourself to the class (10 points).
    - **Send me a picture of yourself**, not just any image, but **one that you really like**, for the class photo. **NO SCREEN SHOTS.** My email is beckerg@moravian.edu. See all classes that have taken my course in the past

here (5 points). You are my 46th astronomy class since coming to Moravian in the spring of 2010.

- ***Distill the Word to Its Basic Meaning*.** In S-01, pp. 5-8: In the Introduction to Astronomy section, complete the exercise adhering to the directions precisely. The full definitions of the vocabulary words that are to be distilled can be found on pp 7-8. Do not look up the definitions on your own. In your core definition, subject-verb agreement/good sentence structure is not necessary. The key words that will help you understand the definitions is the goal. Make a copy of the assignment for you and one for me. The copy for you will act as a study guide because there will be a quiz on these words on the following class evening (10 points).
  - **Example, Long Definition:** Astronomy—The science which investigates all matter and energy in the universe.
    Example, Core Definition: investigates all matter/energy in universe
    Example, Core Definition: science investigates matter/energy in universe
  - **Example, Long Definition:** String Theory—A hypothesis which proposes that the universe is ultimately composed of minuscule vibrating strands of energy which are found within subatomic particles known as quarks. The vibrations of the strings are governed by six additional tiny point dimensions. They create the physical constants that allow us to describe the universe in which we live. According to String Theory, the universe has a total of 11 dimensions.
    Example, Core Definition: universe ultimately composed vibrating energy strands
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

  - **Do not complete Information in grey**. That is a reminder for your instructor.
  - **Download *Stellarium***, a free planetarium program available in Window and Mac formats. This will prove useful in class lab exercises that we will be completing during the semester.
  - ***Astrophysics for People in a Hurry***, written by Neil deGrasse Tyson, director of the Rose Center for Earth and Space-Hayden Planetarium in New York City. Read/listen to, his book. You can complete the entire book in 3-1/2 hours.

    Section One: 1 | 2 | 3 | 4 | 5 | 6 | 7
    Section Two: 8 | 9 | 10 | 11 | 12 | 13 | 14
    Section Three: 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22

    Write three well constructed multiple choice questions, one from each section: Each question will contain four possible answers, a, b, c, d. Highlight the correct answer.

    Format: Provide your name, Instructor: Gary A. Becker; PHYS 108, Astronomy; and the Date, on the first four double-spaced lines on the upper left of page one. **Longhand submissions will not be accepted.** This will get us started during the first week of class and make our time spent together more productive (10 points). Here is an example of an average multiple-choice question.

    Which list gives the correct ordering of the various parts of the electromagnetic spectrum from **most energetic to least energetic**? Not all of the energies of the electromagnetic spectrum are represented in each list.

a. gamma ray, visible, X-rays, radio, microwave
b. radio, infrared, visible, ultraviolet, gamma ray
c. microwave, radio, gamma ray, infrared, ultraviolet
d. X-ray, ultraviolet, infrared, microwave, radio
e. visible, infrared, ultraviolet, microwave, X-ray

Sometime during the first three weeks of class, I will construct a quiz (20 points or less) to test your knowledge of the fundamental information in Tyson's book. The quiz will be composed of your questions. Keep the questions basic. The goal is not to outsmart your fellow students because you will be answering their questions as well.

Week One—Tuesday, January 20/Thursday, January 22: S-01: Introduction to Astronomy

- **FOCUS:**
  - **Instructor/Students introduce themselves to the class:**
  - **Class routine**—student/teacher discussion. Questions are answered.
  - **Students form teams**.
  - **Introduction to the Sky Deck**.
  - **Students develop a definition for astronomy** using their self-generated vocabulary list (Free Point).
  - **Student/Teacher driven discussion** about topics in astronomy to show some of the basic concepts about the subject—questions/reflections/thoughts about the universe in which we live. This is a wonderful chance for pupils to consider the scope of astronomy. This lesson is not reflective as to how the course will be taught from week to week.
- **ASSIGNMENTS Due:**
  - **Submit** your multiple choice questions from ***Astrophysics for People in a Hurry*** (10 points).
  - **Hand in** *Distill the Word to Its Basic Meaning*, pp. 5-6 in the *BASN Text*. The words to be defined are found on pp. 7-8. Make two copies, one for you and one for me. Your copy will allow you to study for the quiz that will be given during the following evening of class (10 points).
  - **Submit your Student Information Sheet** (10 points).
  - **Make sure you have emailed me**, beckerg@moravian.edu, a picture of yourself that you like (5 points). Images should be in large format. Screen captures will not be accepted.
- **Test your visual knowledge of astronomy** if time permits.
- **Thursday**
  - **DEMONSTRATIONS**: Fahrenheit 451 experiment/expanding gases from an air can/plasma ball/dry ice is nice.
  - **Explore the concepts** of composition, distribution, evolution, movements, and physical states as they relate to astronomy.
  - **QUIZ ON INTRODUCTORY VOCABULARY:** Vocabulary in Session One—in class—in teams—at the end of class—match the definition on one card with the word on a separate card—be happy!

- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Two— Tuesday, January 27/Thursday, January 29: S-02: Popular Misconceptions in Astronomy

- **FOCUS**: **TUESDAY'S/THURSDAY'S** classes will be about basic misconceptions in astronomy and lunar phases: There are a million ways to learn about lunar phases. Then there are the seasons. Demonstrations, exercises, quiz preparation; we will have fun times at Moravian University.
- **ASSIGNMENTS:**
  - **Complete before class** the *Harvard Misconceptions Lab*, pp. 29-30, in the *BASN Text*. This will be a graded assignment. **You should research and compare your answers with other students before class.** Make **two** copies, one for you and one for me. Hand in one of the copies before class (10 points). The other copy is for you to self-grade. ***If you have not completed this assignment by the time class starts, you will receive a zero.***
  - **Read** *BASN Text* Popular Misconceptions in Astronomy through Earth, sun, and moon relationships.
  - **PowerPoint:** Review the *Lecture Slides*: Gain a little familiarity with the images to be shown in this week's class. Familiarize yourself with Earth-Moon-Sun relationships.
  - **YouTube:** Watch the following.
    Phases of the Moon (Watch first)
    Phases and Motions of the Moon (Watch second)—Launch Pad Astronomy
    Why Do We Have Different Seasons? —California Academy of Sciences
- **LABS:**
  - Students will use *Moons on a Stick* in class to learn the lunar phases.
  - *Know the Moon's Phases* To be completed in class. This exercise is found on pp. 49-50 (10 points).
- **LAB**: If bad weather cancelled the Lunar Photographic Contest on September 2: This is a good weather event that will be held on the Sky Deck… See the *Rules for the Lunar Photo Contest*.
- **EXERCISE:** Test your visual knowledge of astronomy if time permits.
- **Self-Test:** *Popular Misconceptions in Astronomy Study Guide*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Three—Tuesday, February 3/Thursday, February 5: S-02: Popular Misconceptions in Astronomy

- **FOCUS** on understanding the motions of the moon: Review phases, synodic/sidereal periods, moon illusion, blue moon, moon rotation, changing distance (perigee/apogee), and lunar librations.
- **ASSIGNMENTS:**
  - **Read:** Finish *BASN Text* Popular Misconceptions in astronomy through the end of the unit.

  - **Study for Lunar Phase Quiz** as per the practice quiz in the *Lecture Slides*. Know the phase that comes before and after the phase shown on the screen. Download a lunar phase application on your smartphone or randomly self-test by picking slides in the lunar phase section of the Popular Misconception *Lecture Slides* and identify. You can also go here to self-test yourself on lunar phases.
  - **YouTube:** *NASA's Lunar Reconnaissance Orbiter—PHASES/LIBRATONS-2019*. View this in preparation for the *Lunar Phases, Orbital Period, Distance, Librations Lab* and the class discussion.
- **LAB:** *Lunar Phases, Orbital Period, Distance, Librations Lab* To be completed in class. This lab is found on pp. 53-62 and it will be submitted before the end of class (20 points).
- **THURSDAY Quiz on Lunar Phases:** (10 points), first activity when class starts. Students will take this quiz independently.
- **EXERCISE:** Test your visual knowledge of astronomy if time permits.
- **Self-Test:** *Popular Misconceptions in Astronomy Study Guide*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Four—Tuesday, February 10/Thursday, February 12: S-02: Popular Misconceptions in Astronomy

- **FOCUS Thursday** on the Seasons**:** The seasons will be demonstrated via teacher, student, and computer-centered activities. Check out the slide set about *The Seasons* that I developed for an all-age audience. Misconceptions about the seasons, demonstrating insolation with a flashlight, Earth globe demonstrations—straight axis, flipping axis; computer demonstrations to illustrate the change in altitude, change in the length of the day, change in the position of sunrise and sunset, and the 180-degree rule with respect to opposite solstice rise and set positions. Students will demonstrate the seasons to each other with an Earth on a Stick and eventually for a grade. There are many fun ways to learn about the seasons.
- **ASSIGNMENTS:**
  - **Read:** By this time students should have read all of the material in S-02: Popular Misconceptions.
  - **Begin Reading and Viewing** some of the assignments in Session Three, S-03: Archaeoastronomy to lessen the work burden for Week Eight.

LABS: Here are some possible labs that students may complete in class.

- *Seasons Graphic Organizer* To be completed in class. The seasons will be understood using a flow chart.
- *Understanding the Seasons* To be completed in class. The *Season's Graph* is a necessary component of this lab.
- *Geometry of the Seasons* To be completed in class. Students will construct a geometrically accurate representation of the seasons using protractors, rulers, and pencils. The lab is found on page 41 in S-02: Popular Misconceptions (10 points).

- **We may have enough time to move into the first lesson in Archaeoastronomy.** If this happens, we will start with David Letterman's *Top-Ten-Reasons*. No preparation is necessary at this point.
- **Self-Test:** *Popular Misconceptions in Astronomy Study Guide*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Five—Tuesday, February 17/Thursday, Thursday, February 19 S-03: Archaeoastronomy

- **FOCUS** on understanding how Stonehenge (England) was used as a calendar for seasonal and lunar cycles, and how astronomy was incorporated into the lives of the Ancestral Puebloans who lived in the Four Corners region of the US with emphasis on The Chaco Phenomenon which occurred in the region of Chaco Culture National Historical Park in northwestern New Mexico.
- **ASSIGNMENTS:**
  - **Read:** *A Sky for All Seasons, Edwin Krupp* An excellent introduction…
  - **Read:** S-03: Archaeoastronomy, the textual material only. Do not complete any of the laboratory exercises.
  - **PowerPoint:** *Lecture Slides* Become familiar with these visuals.
  - **View at Least Two of the YouTube Videos Below.**
    A History of the Ancient Southwest (Lekson)
    Stonehenge Secrets: What Lies Beneath?
    Standing with Stones - an epic journey through prehistoric Britain & Ireland
    Decoding the ancient astronomy of Stonehenge
    Uncovering the secrets of Stonehenge
    Megalith Movers: Building Stonehenge
    Solving The Mystery Of Stonehenge With Dan Snow
    New scientific discoveries: reinterpreting Stonehenge
    Stonehenge 360 Degrees
- **Keep in mind** the *Top-Ten-Reasons* You Want to Become an Ancestral Puebloan Priest assignment. Read the instructions carefully. Here are example of the Top Ten.
- *Letterman's Top Ten* | *Imaginary Girlfriend* | *Homer Simpson* | *Final Top 10* | *Why I Teach* | *Siri* | *Join the Air Force*
- Class Video: *Chaco: Pueblo Bonito* Julia Shively video
- Class Video: *Pueblo Bonito to the End of the Unit* Julia Shively video
- Reading: Pages 69-71 and pp. 77-86 in your *BASN Text*.
- Reading: *A Sky for All Seasons, Edwin Krupp*
  - **View One of the Items Below.**
    WWWeb: Chaco Culture National Historical Park
    The Cannibals Of The Four Corners | Timeline
  - **View One of the Items Below.**
    Chacoan Astronomy, Cosmography, Roads, & Ritual Power
    EXPLORING CHACO CANYON: History, Information, Hikes, etc.
    Studying Southwestern Archaeology by Dr. Steve Lekson
    What Was Chaco, Really? (Lekson)

- **LAB** Introduction**:** *Top-Ten-Reasons* You Want to Become an Ancestral Puebloan Priest. This lab will be completed in class and as a homework assignment. The Top

10 was a favorite on *Late Night* hosted by David Letterman when the program aired many years ago. See if you can adapt his humor to the Ancestral Puebloans living in Chaco Canyon. Here is a preview, *Letterman's Top Ten*. Work on this assignment during the week and during class as material is being presented and ideas pop into your mind. Each student should create a minimum of five reasons why they would want to become an Ancestral Puebloan priest. More is joy in this situation and students will be rewarded with a higher grade if they produce more than five reasons in their list. During a future class, each team will create a combined list of the best top 10 statements from its members and submit that for a grade. I will take all of the top 10 lists and combine them into one or two finalized lists that will be distributed to the class. Many students have called this the best assignment of the course. The manner in which the assignment will be completed is very similar to how Letterman's writers compiled listings for *Late Night* viewers.

- **Get an idea of the Letterman Format with these videos:** *Letterman's Top Ten* | *Homer Simpson* | *Final Top 10* | *Why I Teach* | *Siri* | *Join the Air Force*
- **LAB:** *Stonehenge*—To be completed in class. Students will discover the astronomical mysteries of Stonehenge by using their knowledge about the seasons and applying it to this ancient structure (5 points).
- **Possible LAB:** *Save Your People Marry That Girl*. To be completed in class. Sounds a little sexist, but this lab is probably closer to the truth than most archaeologists would like to admit. Chacra Vida knows that if he can create a solar calendar, he will have the opportunity to court and marry the woman of his wildest fantasies, Tsin Kletsin's daughter. This scandalous lab can be found on pp. 73-4 in S-S-03: Archaeoastronomy. This will be a team effort completed in class and count 10 points.
- **Self-Test:** *Archaeoastronomy Study Guide*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Six—Tuesday, February 24/Thursday, February 26: S-03: Archaeoastronomy, the Chaco Phenomenon; Solar and Lunar Eclipses, S-05: Eclipses

- **TUESDAY'S FOCUS: Chaco**
- **Keep in mind** the *Top-Ten-Reasons* You Want to Become an Ancestral Puebloan Priest assignment. Read the instructions carefully. Here are example of the Top Ten.
- Class Video: *Chaco: Pueblo Bonito* Julia Shively video
- Class Video: *Pueblo Bonito to the End of the Unit* Julia Shively video
- Reading: Pages 69-71 and pp. 77-86 in your *BASN Text*.
- Reading: *A Sky for All Seasons, Edwin Krupp*
    - **View One of the Items Below.**
      WWWeb: Chaco Culture National Historical Park
      The Cannibals Of The Four Corners | Timeline
    - **View One of the Items Below.**
      Chacoan Astronomy, Cosmography, Roads, & Ritual Power
      EXPLORING CHACO CANYON: History, Information, Hikes, etc.
      Studying Southwestern Archaeology by Dr. Steve Lekson
      What Was Chaco, Really? (Lekson)

- **COMPLETE LETTERMAN'S** *Top-Ten-Reasons* why you would want to become an Ancestral Puebloan priest. Students will work in teams, in class and receive an individual grade for supplying at least five reasons (a higher grade for more than five reasons) and a team grade from the instructor for the team's effort to supply at least one Top Ten list.

- **THURSDAY'S FOCUS: A total solar eclipse is something that you should put on your bucket list.** It is probably the most spectacular astronomical phenomenon that you can witness. Conditions that create solar and lunar eclipses, different types of eclipses, repetition of similar eclipses (saros cycle), visual aspects of solar and lunar eclipses, and observing techniques will be topics of discussion. Although lunar eclipses, where the moon hides in the Earth's shadow, are different from solar eclipses, where the moon blocks the sun, most of the topics applicable to solar eclipses are relevant to lunar eclipses. Therefore, discussing lunar eclipses will take a much shorter amount of time than the period spent learning about solar eclipses.
  Upcoming lunar eclipses visible from Moravian's Campus and North America: A total lunar eclipse will be seen on the morning of Tuesday, March 3, 2026; during the late evening of Thursday and early in the morning of Friday, August 27/28, 2026 (very deep partial); Saturday evening, February 20, 2027 (penumbral); Tuesday, January 11, 2028 (very shallow partial). On Sunday/Monday, June 25/26, 2029 the center of the moon passes directly through the center of the Earth's shadow to produce an extremely long totality of 1 hour, 42 minutes. **The first partial solar eclipse visible from the Moravian campus** will happen on Saturday, January 14, 2029.
- **ASSIGNMENTS:**
  - **Class Video:** *Eclipses Shown to Scale-Video* Peyton Zankel video
  - **Class Video:** *Eclipse Talk, Repetition of Eclipses-Video* Peyton Zankel video
  - Class Audio: *Eclipse Talk, Repetition of Eclipses-Audio* Peyton Zankel audio
  - Transcript: *Eclipse Talk, Repetition of Eclipses-Transcript*
  - Class Video: *Gear and Techniques, Lunar Eclipses-Fall 2020 Video* Peyton Zankel video
  - **Class Video:** *Gear and Techniques-Spring 2021 Video* Peyton Zankel video
  - Reading: *Aspects and Motions of the Moon: Eclipses, George Abell*
  - **Read** the information on eclipses in Session Five in the *BASN Text* but do not complete any of the exercises unless assigned or
  - **READ** *Aspects and Motions of the Moon: Eclipses*, by George Abell. You do not have to read both assignments.
  - **Submit on Tuesday** the exercise, *Distill the Definition* to Its Basic Meaning in the eclipse section, pp. 211-212. The words to be reduced to their core meaning can be found on pp. 213-215 in your Lab Manual. Follow the directions precisely.
  - **View the Two YouTube Videos Below Including Two Excitement Videos:**
    The Moon's Orbit and Eclipses—Launch Pad Astronomy
    You Owe it to Yourself to Experience a Total Solar Eclipse | David Baron
    Excitement: *When Day Became Night: A Special Report on the 2017 Solar Eclipse*

Excitement: *Alaska Airlines: Great American Eclipse Flight #9671*
Excitement: *Alaska Airlines: Great American Eclipse Flight #870—Oh my God!*
Excitement: *Total Solar Eclipse (2017)*
Excitement: *Space Station Transiting 2017 ECLIPSE, My Brain Stopped Working*
Music: *Bonnie Tyler—Total Eclipse of the Heart* (Video)
Music: *You're so Vain—Carly Simon* (Video)

- **Self-Test:** *Solar and Lunar Eclipse Study Guide*

Week Seven—Tuesday, March 3/Thursday, March 5— Jam and Cram for the Exam

FOCUS:

- **KETCHUP TUESDAY:** We will complete the unit on solar and lunar eclipses. See the previous week for assignments.
- **THURSDAY EXAM on introductory material, popular misconceptions, archaeoastronomy, and eclipses, Sessions One, Two, Three, and Five.** This test will happen after the conclusion of eclipses, but not before I have had the chance to review material and answer questions from class members. The exam will be mostly multiple choice and a few fill-in-the-blank questions and be valued between 60-70 points. The exam will be given on CANVAS. Students may work in teams of two so that each student may act as a lifeline for the other.
- **Self-Test:** *Introduction to Astronomy Study Guide*
- **Self-Test:** *Popular Misconceptions in Astronomy Study Guide*
- **Self-Test:** *Archaeoastronomy Study Guide*
- **Self-Test:** *Solar and Lunar Eclipse Study Guide*
- **Self-Test:** *Solar and Lunar Eclipse Study Guide*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Eight— S P R I N G B R E A K: Tuesday, March 10/Thursday, March 12: No Classes—School's out forever, well at least for one week! ENJOY!

Week Nine— Tuesday, March 17/Thursday, March 19: S-14: Stellar Evolution—Part One: Stellar Characteristics/Stellar Distances/Distance Modulus/Stellar Luminosities

- **FOCUS:** We will learn about the general characteristics of hydrogen burning (Main Sequence) stars, how the distances to the stars are found using a new unit of measurement called the parsec, and how astronomers can mathematically move a star to a standard distance to understand its true luminosity (brightness).
- **ASSIGNMENTS:**
  - **Read:** *BASN Text*: through the Distance Modulus
  - **Read:** *Significant Number Rules-PDF*
  - **PowerPoint** *Lecture Slides*: Through the Distance Modulus
  - **YouTube: Watch the Following Videos**
    Analyzing Starlight Part 1: Brightness—LPA

#23 Light—Crash Course Astronomy
#24 Distance—Crash Course Astronomy

- **LAB: Parallax—**To be completed in class.
  Parallax Lab-Orion-PDF
  Parallax: Begin at 1 hr. 18 min. 26 sec.
  Significant Number Rules-PDF
- **LAB: Distance Modulus—**To be completed in class.
  Great Summer Triangle Lab-PDF
  Great Summer Triangle Lab-Instructional Video-Distance Modulus
  Great Summer Triangle Lab-Class Instructional Video
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Ten— Tuesday, March 24/Thursday, March 26: S-14: Stellar Evolution—Part Two/Emission and Absorption Spectroscopy

- **FOCUS:** Another way of classifying stars is to understand their temperature. This is accomplished by creating emission spectra in the laboratory, then comparing them to the absorption spectra of the stars astronomers wish to study.
- **LAB: Emission Spectra—**To be completed in class. After a short presentation, we will examine emission spectra to determine how composition is determined. Understanding emission spectra is more of an exercise for astronomers who collect data in a laboratory. Precisely mapping an element or compound in emission leads to the identification of that same element and much more information when stellar absorption spectra are imaged.
  Emission Spectrum Lab-PDF
  Emission Spectrums to be Identified for Lab-PDF
  Emission Spectrum Lab-Instructional Video
- **ASSIGNMENTS**
  - **Read:** *BASN Text* through Emission and Absorption Spectrums
  - **PowerPoint:** *Lecture Slides* through Black Body Radiation, the Doppler shift, Emission, and Absorption Spectrums
  - **YouTube Videos to Watch:**
    Light and Temperature—Launch Pad Astronomy
    Spectroscopy—LPA
    Analyzing Starlight Part 1: Brightness—LPA
    Analyzing Starlight Part 2: Colors—LPA
    Analyzing Starlight Part 3: Stellar Spectral Classification—LPA
    How Stars Work—LPA
- **Self-Test:** Questions: Light and Distance
- **SECOND EXAM will be given in two weeks:** The second exam will be given online on Tuesday, April 8 between 6:30 p.m. and 9:30 p.m. The basic questions from which the Second Exam will be constructed are given with this self-test link: *Stellar Evolution Study Guide*. These questions will continue to be revised until the exam is given.
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Eleven— Tuesday, March 31/Thursday, April 2: S-14: Stellar Evolution—Part Three/Absorption Spectroscopy/Construction of a Hertzsprung-Russell Diagram/The birth, life, and death of stars.

- **FOCUS:** When light passes outward from a star, some of its energy is absorbed by the star's atmosphere to produce an absorption spectrum when recorded by a spectroscope. All of the colors of the rainbow (spectrum) are represented except for the specific wavelengths that are absorbed. The absorbed wavelengths appear as dark lines on the continuous spectrum, and their intensities in relationship to other absorption lines allow astronomers the ability to classify stars into the O, B, A, F, G, K, M system. We now have all of the necessary components to understand the Hertzsprung-Russell Diagram, a graphical two dimensional system that plots the temperature of a star (x-axis) in relationship to its absolute luminosity (y-axis). This achievement became the Rosetta stone for astronomers, allowing them to begin to understand how stars evolve from birth to death.
- **LAB:** To be completed in class.
  Absorption Spectrum Lab-PDF
  High Resolution Absorption Spectrum
  Absorption Spectrum Lab-Instructional Video
- **LAB:** To be completed in class. Students will discover how the Hertzsprung-Russell Diagram leads to an understanding of the evolution of stars.
  Construction of an H-R Diagram Lab-PDF
  Hertzsprung-Russell diagram
- **ASSIGNMENTS:**
  - **Read:** *BASN Text*, pp. 503-4 (Do not complete the lab), p. 505, pp. 515-19.
  - **PowerPoint:** *Lecture Slides* through the death of stars
  - **YouTube:** Watch the following videos.
    HR Diagram Explained
    Module 9 / Lecture 3: The Hertzsprung-Russell Diagram
    Stars and Galaxies: The Hertzsprung-Russell Diagram
    Star Formation—Launch Pad Astronomy
    How the Sun will REALLY Die—Launch Pad Astronomy
    The Smallest Stars in the Universe-Red Dwarfs—Launch Pad Astronomy
    #26 Stars in General—Crash Course Astronomy
    #29 Low Mass Stars—Crash Course Astronomy
- **SECOND EXAM/STELLAR EVOLUTION, TUESDAY, December 9:** between 6:30 p.m. and 9:30 p.m. in Room 106. The basic questions will be constructed from this self-test exercise, *Stellar Evolution Study Guide*. These questions will continue to be modified and new questions added until the exam is given.
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Twelve—Tuesday, April 7/ Thursday, April 9: S-14: Stellar Evolution – Hertzsprung-Russell Diagram/The birth, life, and death of stars.

- **FOCUS:** Students will discover through an interpretation of the Hertzsprung-Russell Diagram the conditions that foster stellar birth, the life of main sequence stars, and

their deaths through the interpretation of images taken with the Hubble Space Telescope, the James Webb Space Telescope and other terrestrial and space borne instrumentation.

- **ASSIGNMENTS:** Watch the following YouTube videos.
  - How massive stars die - with a BANG!
  - Neutron Stars, Pulsars, and Magnetars—Launch Pad Astronomy
  - The Physics of Black Holes
  - Monster Black Holes
  - #30 White Dwarfs and Planetary Nebulae—Crash Course Astronomy
  - #31 High Mass Stars—Crash Course Astronomy
  - #32 Neutron Stars—Crash Course Astronomy
  - #33 Black Holes—Crash Course Astronomy
- **LAB:** Students will begin to understand the importance of the H-R Diagram by determining the ages of star clusters in the Milky Way Galaxy that are too distance to determine their parallax.
  - *Determining the Age of Star Clusters-PDF*
  - *Determining the Age of Star Clusters-Instructional Video*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Thirteen—Tuesday, April 14/Thursday, April 16: S-06: Telescopes/Observing

- **EXAM on Stellar Evolution and the Hertzsprung-Russell Diagram:** Questions will be drawn from the *Stellar Evolution Study Guide*.
- **FOCUS:** *Make A Drawing Through A Telescope* Students will complete a drawing with the aid of a telescope. These instruments were designed by the International Astronomical Union in celebration of Galileo's construction of a telescope in 1609. Optically they are good, but lack some of the refinements that pupils will enjoy using with our modern scopes on the Sky Deck. After the drawings are completed, learners will share their experiences, including frustrations, and make suggestions about how they would improve their telescopes (10 points).
- Learn how to use the hand controllers on the telescopes in Rm 106 or the Sky Deck. That will most likely happen on Thursday.
- ***Astrophysics for People in a Hurry*:** I have not forgotten about discussing this assignment. This is a great time for students to ask questions and respond to the material that they have read or listened to. This may happen during the second half of class on Tuesday.
- **Video:** *400 Years of the Telescope* if time permits.
- **Inclement Weather** may necessitate other class objectives from the instrumentation unit to misconceptions. Assignments will only encompass material from the instrumentation unit until that information is exhausted. Then the class will shift to Popular Misconceptions in Astronomy.
- **ASSIGNMENTS:**
  - **Read**: *Telescopes in General by Neale Howard*.
  - **YouTube:** Watch the following Videos. Pace yourself. You can view these over the next several weeks.
    #6 Telescopes: Crash Course Astronomy
    Telescopes: A Buyer's Guide - The Night Sky -

Choosing Your First Telescope" with J. Kelly Beatty
How to use an Equatorial Mount for Beginners
How to Align a Finderscope for New Astronomers

- **LAB:** *Identify the Celestial Objects* **To be completed outside of class. Submit definitions by Thursday. Submit the** *Celestial Object To Be Identified* **by the following Thursday**, pp. 271-272 (10 points). Your instructor will explain how the lab is to be completed with plenty of examples for students to understand what will be expected in the identification portion of the exercise that will be due on the following Thursday. Some definitions can be found in the *BASN Text*, while you must Google the others. Follow the instructions precisely. In many of the questions, I am asking students to provide specific information. If you do not supply the requested information, you will lose credit.
- **LAB**: Lunar Photographic Contest, Thursday: Weather permitting on the Sky Deck… See the *Rules for the Lunar Photo Contest*. The moon will full on September 7. If we miss that date, we can try again beginning on September 25.
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Fourteen—Tuesday, April 21/Thursday, April 23: S-06: Telescopes/Observing

- **Class Time switches to 6:30 p.m. to 9:30 p.m.**
- **FOCUS**: We will continue to become familiar with the use of the hand controllers in Room 106, or preferably with the telescopes on the Sky Deck. If the night is usable on the Sky Deck, we will learn the full operation of the larger telescopes assembled there. Shorts and open toe footwear are **not** advisable because the covering carpeting the roof is abrasive. If you fall, you could receive a nasty brush burn. Please be forewarned. Bring a light jacket or sweatshirt if the outdoor temperature feels cool or it is windy during the day. Charge your phone so it will be available as a flashlight after dark.
- **FOCUS** on the characteristics of a good telescope (PowerPoint). Aperture, focal ratio, light grasp, magnitude/intensity, resolution, Airy disks, constructive/destructive interference, contrast, definition, magnification, field of view… You will learn the correct questions to ask if you ever purchase a telescope.
- **ASSIGNMENTS:** Pace yourself. The definitions are due on Tuesday.
  - **Submit the** *Celestial Object To Be Identified* **by Thursday**, pp. 271-272 (10 points). This lab will **be completed outside of class.**
  - **Read** *Appendix-4: Syncing Mount and Telescope to Sky BASN Text*. It can found in your lab binders. Get a feeling for the steps needed to get your team's telescope operational on the Sky Deck.
  - **Read** *BASN Text* on telescopes. Do not complete any exercises unless assigned.
  - **Read** *Telescopes in Particular by Neale Howard*.
  - **Review** *Lecture Slides* on telescopes.
  - **View the class video**, *What Makes A Good Telescope?*
- **LABS:**
  - *Identify the Celestial Objects*, part two, **due Thursday**: Students will learn how to identify various kinds of celestial objects in preparation of seeing some similar types of objects through Sky Deck telescopes.

- **Alternate Activity:** Video, *400 Years of the Telescope*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Fifteen —Tuesday, April 28/Thursday, April 30: S-06: Telescopes/Observing

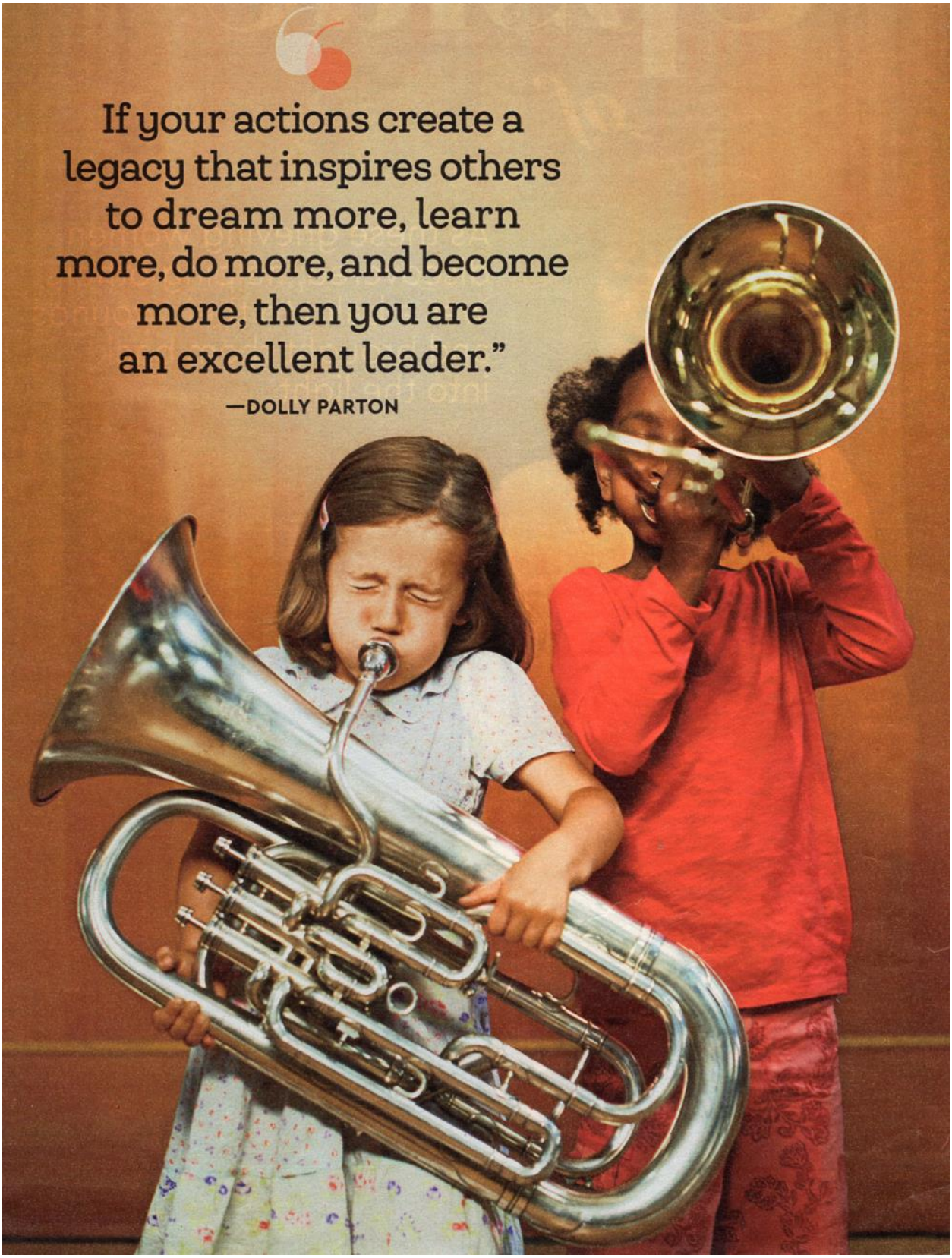
- **Class Time switches to 6:30 p.m. to 9:30 p.m.**
- **FOCUS:** This week the class will complete the unit on telescopes, either on the Sky Deck with the possibility of a quiz accessing the ability of teams to align and calibrate their scopes and find at least six celestial objects. This will be dependent upon the amount of practice time that has accrued and the weather conditions.
- **ASSIGNMENTS:**
  - **Complete and submit** for Thursday the exercise, *Identify the Celestial Objects* template / *Celestial Object To Be Identified*, p. 272 in your Lab Manual (10 points). Use the definition sheet that you completed last week to help you identify correctly the objects pictured. You will find it easier if you work in teams (10 points).
  - **Review** *Lecture Slides* on telescopes.
  - **Review** *The Simpsons: Bart's Comet* in the video section of telescopes. It will make for a very interesting quiz. Good questions are plentiful from this video.
- **FOCUS AREAS if the weather is good or inclement:**
  - on completing PowerPoint lessons on S-06: Telescopes/Observing.
  - on demonstrating the operation of Moravian's telescope on the Sky Deck, weather permitting.
  - on making astronomical observations on the Sky Deck.
  - (PowerPoint). History of the telescope, refractors vs. reflectors, compound systems, catadioptric systems (understanding how telescopes can be made more compact), and identifying telescope and mounting systems are all up for grabs. This information is contained in the video, *What Makes A Good Telescope?*
- **LAB:** *Identify Telescopes and Mounting Systems*. To be completed in class. After a PowerPoint presentation, students will first identify the different types of telescopes and mounting systems that are kept in Rm. 106, and then complete the laboratory exercise linked above.
- **QUIZ:** *The Simpsons: Bart's Comet*. Feel free to view the video in anticipation of a quiz and consider the possible questions that could be asked during the presentation.
- **TELESCOPE EXAM:** Hopefully this will take place on the Sky Deck with students demonstrating their ability to align, calibrate, and use Moravian's instrumentation. Observations of planets, double stars, open and globular star clusters to glean point will be acceptable. For full credit, teams will identify at least six objects. If that does not occur due to inclement weather or students have already completed that identification exercise and time is available, expect a CANVAS test. More information will follow.
- **Self-Test:** *Instrumentation Study Guide*
- **ASSIGNMENTS ARE DUE ON THE NIGHT OF YOUR CLASS.**

Week Sixteen—Tuesday, May 5: THIRD EXAM, hopefully on the Sky Deck:

- **Class Time switches to 6:30 p.m. to 9:30 p.m.**

  You will be demonstrating your capabilities to align and calibrate your telescopes on the Sky Deck. Afterwards, each team must find six celestial objects that may include the moon if visible, planets, open or globular clusters, and nebulae. If the weather is cloudy, each member of every team will do the same using the hand controllers to align and calibrate their scopes. If the weather is inclement, we will do the same either in Room 106 or in the hallway near Rm 106. Afterwards, if it is not raining, we will bring the telescopes down to Room 106 to be stored there for the summer.

HALLELUIAH, IT'S THE END!
Last Update: January 9, 2026


If your actions create a legacy that inspires others to dream more, learn more, do more, and become more, then you are an excellent leader."
—DOLLY PARTON

NOTES

ASTRONOMY SURVIVAL NOTEBOOK

MORAVIAN UNIVERSITY ASTRONOMY STUDENT FOREWORD

ASTRONOMY, as the author of this book teaches, is an elective course designed for nonscience majors at the undergraduate university level who have always wanted to know more about the universe in which they live. The significant areas of focus will include:

- A thorough understanding of the sky and its motions.
- Using telescopes and making astronomical observations.
- The life history of stars.

If time permits, solar system topics will be considered. Many topics come into play when those three focus areas are considered. The syllabus outlines specific lessons that highlight the order that course materials will be presented during the semester.

I can only partially agree with how astronomy is taught at the university level. Most professors attempt to introduce the subject in its entirety, glossing over discussions, such as the night sky, astronomical misconceptions, lunar phases, eclipses, and the seasons—practical topics that should be known and understood if a person is considered well educated. As a result of simply completing the text, no topic, concept, or idea is covered in sufficient depth or with enough repetition for it to become permanently digested by the average student. In addition, many topics become purely exercises in mathematical analysis, with the instructor completing the lesson to an audience tuned out and turned off. Mathematics is a vital tool for students majoring in astronomy, but not necessarily for individuals taking astronomy for the first time as an elective. Yes, there will be some math, but I promise with your cooperation to get you through it. I will concentrate on fewer topics, cover them to a greater depth of understanding, and reinforce information with appropriate activities and visuals. This approach will lead students to understand better the underlying principles and methodologies guiding all scientific inquiry.

I like to think of astronomy as "the beautiful science." Aesthetics has always been the chief motivator for my lifelong fascination with the heavens. Because of astronomy's inherent visual appeal and the mysteries surrounding the understanding of distant places, I became interested in comprehending the science behind the pictures I viewed as a kid and a young adult. It has been a journey that started back in the late 1950s when, as an 8-year-old, I witnessed a bright shooting star flash across a dark sky on a cold, windy, autumn night as I was making my way to a neighborhood Cub Scout meeting. I hope to inspire you with the same sense of wonder and beauty that astronomy has brought to my life.

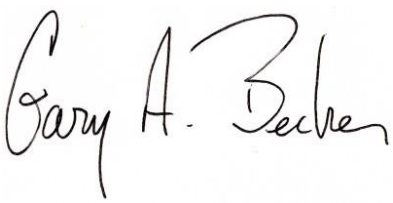
This text and the astronomy course you have chosen are not a one-way street. I want it to be a dynamic and evolving journey that we will share together. All lessons are now online on my homepage, https://www.astronomy.org/moravian/index.html. Students are encouraged to consider this book as a working copy and make suggestions for its improvement. If you find an error, please take the time to tell me about it. Your feedback is not only welcome but essential for the growth of this course. Trust me; I have never been offended by students attempting to improve the academic landscape of my class.

Although the lessons are mainly descriptive, they often have analytical aspects, including some mathematics. Do not panic about this fact. We will complete it together, and you will understand what is happening. With your help, I will be here to guide you through any challenging aspects and ensure you feel confident in your understanding. Keep a positive attitude, ask questions, follow my suggestions and instructions, and complete work on time and in an orderly and neat fashion, and you will be on the fast track to a successful experience in this course.

To get the most from this program, I have a website you should investigate, astronomy.org, which should help contribute to the enjoyment and assimilation of the instructional material. The links associated with ***Moravian University Astronomy*** can be accessed *here* or by clicking the Sky Deck picture on my homepage. *Astronomy* Links, *Weather* Links, *StarWatch*, and *Astrophotography* are good resources. I also recommend the online astronomy articles on *Wikipedia* as helpful and written well. Although the Internet can be an excellent tool for gaining valuable and particularly timely information about astronomical topics, there is a catch. Much of the general online material has no peer evaluation, can be opinionated, and often contains errors. Readers, beware!

Thank you for perusing my intentions for the curriculum of PHYS 108, Astronomy, and how I would like to instruct my class. I wish everyone much success as we journey together through this universe and the contents of this course.

Ad Astra!



Gary A. Becker
Moravian University Astronomy
December 10, 2025

Gary A. Becker, happy in the Blue Mountains of Australia after viewing the April 20, 2023 total solar eclipse from the North West Coast.

***** BECKER'S *****

ASTRONOMY SURVIVAL NOTEBOOK

General Course Information and Classroom Routine

DESCRIPTION OF CURRICULUM: ASTRONOMY is a course designed for individuals who have always wanted to explore the universe around them. Topics of discussion will include lessons on astronomical misconceptions, archaeoastronomy (astronomy of the ancients), eclipses, instrumentation, the life and death of stars, and, if time permits, the evolution and characteristics of the solar system. Students will also gain familiarity with the heavens through possible planetarium visits and observations of the real sky on Moravian's Sky Deck on the fifth floor of the Collier Hall of Science.

COURSE OBJECTIVES:

1. To provide students with an accurate, up-to-date informational portrait of the science of astronomy. LinC-2, 4, 6
2. To show the validity of the process of science in problem-solving situations. LinC-1
3. To differentiate between qualitative and quantitative approaches to understanding astronomy. LinC-3
4. To demonstrate the interdisciplinary nature of astronomy as it relates to other branches of science, mathematics, and the humanities. LinC-5, 6
5. To allow students to become familiar with the many facets of the night sky through planetarium demonstrations, computer simulations, and real-time and remote observations of the heavens. LinC-5
6. To provide the type of classroom experience in which a nonscience-oriented individual feels that they have the opportunity to succeed. LinC-1-6

Moravian LinC Student Outcomes

1. Understanding of and ability to conduct the scientific method
2. Understanding about the fabric and the substance of the particular scientific discipline
3. Understanding of the quantitative and qualitative aspects of that scientific discipline
4. Awareness and appreciation of change within that scientific discipline
5. Awareness and appreciation of the role of creativity within that scientific discipline
6. Awareness and appreciation of some broad implications of that scientific discipline

GRADING PROCEDURE: Students' semester grades will be determined by the number of points accumulated divided by the total number of points possible. An attendance grade will be part of this formula. A participation grade will be added to the numerical percentage to produce the final grade. Semester grades will be accrued from the following criteria:

1. **Examinations:** There will be two to three examinations. **They will not be cumulative.** The first test will follow the completion of eclipses. The second exam will encompass the evolution of stars. The third exam will occur at the time we conclude instrumentation. That will happen on the night of the final examination. The tests will be mostly objective and compiled from classroom discussions, field experiences, observing sessions, and reading assignments. **The exams will be difficult**, accounting for about one-third of your final grade. If warranted, grades in an exam will be scaled upward to a mid-C, 75 percent. Grades will never be scaled downward. Generally, a student's cumulative grade goes down after an exam, so it is essential to attend class regularly and perform well in quizzes and daily laboratory exercises, which are easier.

2. **Quizzes:** During the semester, numerous announced and a few unannounced quizzes will be administered. Each quiz will be approximately 10-20 minutes long and usually consist of questions that will be answered in written form. **Grades will never be scaled.**
3. **Laboratory Exercises:** Laboratory exercises will be assigned to students as classwork and some as homework assignments. **Accuracy, clarity of presentation, and neatness** will be used as criteria for grading purposes. When graphs or drawings are submitted for grading, the following weights will be assigned: accuracy (60% of grade), labeling (20% of grade), and neatness (20% of grade).
4. **Participation: Attendance does not count as participation.** If you have a question and do not ask it, you do yourself and me a disservice. Your chances of learning specific concepts are diminished, and I get a false sense of accomplishment, neither of which is good. **Your participation is genuinely encouraged, and it will be rewarded in your final grade by adding as much as five percentage points to it.** It becomes boring if information is flowing from only one direction. **Class attendance, taking notes, and looking attentive are** not considered class participation. **Students have a responsibility to assist in keeping classes exciting and dynamic.** Active learners help me to achieve my greatest potential as an educator. Some of the criteria for appropriate participation follows:
   a. In non-testing situations, helping others who may have difficulty understanding conceptual ideas, performing demonstrations, or working on mathematical exercises. Those who have more to give need to give more.
   b. Asking and answering questions during classroom presentations and laboratory exercises.
   c. Being a team player or becoming a team leader.
   d. Assist your instructor in improving his astronomy lessons, ***Astronomy Survival Notebook***, lab manual, and website through constructive criticism or noting errors.
   e. Staying with your partner when you may have finished first but your colleague is still working on the assignment. Just because your work is completed does not release you from your obligation to help others.
   f. Students who are willing to become team leaders or field trip drivers.
5. **Free Points:** Students can accumulate free points from the "What is it?" questions, competitive exercises during lessons, disclosing errors in this book, and other positive contributions that improve the educational value of the material taught in this course. These points are added only to the final grade fraction's numerator (top part).
6. **Late Work** will receive a lower grade than work submitted on time. Failure to complete assignments within a reasonable interval of time will result in a much-reduced grade or a grade of zero being assigned to that work.
7. **Absenteeism:** Students are responsible for making up all missed work within a reasonable time interval when legally absent. Depending upon circumstances, pupils who have illegal absences (unexcused) may **not** be granted the same privilege of completing missed work for a grade.
8. **Qualitative Assessments:** It is within the instructor's purview to apply qualitative judgment to determine an assignment or course grades. A practical application of a qualitative assessment would be in-class participation.
9. **Extra Credit:** No extra credit will be allowed this semester.

Lost Loaned Materials: A student will not receive a final semester grade unless the total cost of any missing material loaned to that student is remitted. This does not include the ***Astronomy Survival Lab Manual***.

Determination of Semester Grades: Scaled examination scores, quizzes, class participation, attendance, free points, and laboratory exercises will determine semester grades. Participation could add as many as five percentage points to a semester grade. Moravian's +/- grading policy will be adhered to as noted below:

	A ≥93%,	**A-** ≥89.5%<93%,
B+ <89.5%≥87%,	**B** <87% ≥83%,	**B-** ≥79.5%<83%,
C+ <79.5%≥77%,	**C** <77% ≥73%,	**C-** ≥69.5%<73%,
D+ <69.5%≥67%,	**D** <67% ≥63%,	**D-** ≥59.5%<63%,
F <59.5%		

Students always have a right to know their grades. Grades will generally be available for inspection before or after class. I do not use Canvas for grading purposes except for exams, although this semester exam will be on paper and manually graded. Students will need to know the six critical numbers of their ID because grades will never be shown along with names.

Notebook Information:

1. **Your *Astronomy Survival Lab Manual* is a crucial resource and will be brought to every class, except on dates when off-campus field experiences are scheduled.**
2. Each student must keep a notebook containing all of the information given in class and any materials otherwise assigned. Your online ***Astronomy Survival Notebook*** and **Lab Manual** should serve this purpose well. It is your primary texts for the course.

Bring your *Astronomy Survival Lab Manual*, a pencil, a pen, a calculator, and a flashlight to each class. Keep your computer or notepad and smartphone in your backpacks during class time unless instructed to use them.

Attendance Policy and how it can influence grades: This course encourages students to practice good attendance habits. Everyone wants an "A." It has no chance of happening if you do not attend classes.

Students will sign in when they arrive to class. Students are expected to attend all classes, to be on time (6:00 p.m.), and to be in a state of preparedness regarding the instructional material. Students will receive a bonus **of 10 free points** if they are present for all classes. Excused absences will receive a bonus deduct of four points for the first absence and three points for each additional absence until a zero is attained. Students with other excused absences will see no further reduction in points to affect their grades.

To avoid a penalty for an unexcused absence, pupils need to inform their instructor. Without this courtesy, your instructor is not responsible for contacting you about the work that you missed. Pupils can provide documented proof for the absence when they return to class. The excuse must be valid for the day(s) of absence**.** Students may also use the ***Medical Excuse Note Policy*** form that is located in the *Student Information* section of their ***Astronomy Survival Notebook.*** Pupils may also simply email or text your instructor before class (610-390-1893). An excused absence does not have to be for medical reasons, but it does have to be verifiable. **Please note that if you skip class after signing in,** your instructor will consider your absence unexcused for the class period. If you must leave class for a valid reason, please speak to your instructor. The penalty structure for unexcused absences will be as follows:

Penalties for Unexcused Absences

Classes Missed:	0	1	2	3	4	5	6	EVENT	7	BLACK HOLE
Reward/Deduct:	+10	-1 +	-2 +	-4 +	-8 +	-16 +	-32 +	HORIZON	-64	OF DEATH
Total Penalty Applied		**-1**	**-3**	**-7**	**-15**	**-31**	**-63**		**-127**	**—YOU FAIL—**

Contact your instructor at beckerg@moravian.edu / 610-390-1893 if you are going to be absent or late to class so that he knows where you are. When pupils are proactive, it makes for a smoother-running class and a better student-teacher relationship. Depending on your number of absences, this may count as your excuse for being absent. Your instructor is also obligated to contact you about the work that you missed when you inform him of your absence.

Being late habitually will cost a student attendance points, depending on the circumstances surrounding the tardiness. Normally, three late class appearances equal one excused or unexcused absence, depending on the circumstances.

The Academic Code of Conduct as outlined in the Moravian University Student Handbook and online resources at https://www.moravian.edu/catalog/academic-regulations/academic-code-of-conduct, is a cornerstone of our institution. **To put it plainly, if you cheat and get caught, and the Academic Standards Committee finds you guilty, you could fail the entire course.** I take academic dishonesty seriously and will **vigorously pursue** any student I can prove is cheating. I encourage students to do the same if they witness cheating in class.

KEEP YOUR Laptops/ iPads closed or off during class time: However, you should bring your laptops and iPads to every class because sometimes you will be using them. In the past, my teaching assistants have informed me of their inappropriate use and this has continued to escalate to the degree that I believe some action is appropriate and necessary.

Smart Phones: Turn your smart phones off.

Confiscation of Smart Technology: Your instructor has the right to remove from your possession any smart technology, including laptop computers, smart watches, smartphones, etc., that are used inappropriately. Any confiscated device will be returned to the student at the end of the instructional period.

No Student Electronic Recording of Class Presentations will be Allowed Unless Specifically Approved by Moravian Administration or Gary A. Becker. That includes audio and video, along with any recording device. Lesson videos are available here in the appropriate chapter (session) locations.

Astronomy Classes or Varsity Sports/Music Rehearsals/Club Events: You chose this class to fulfill a graduation requirement. Your first responsibility/priority is to be in astronomy class. Speak to your instructor if there is a problem. He will try to propose solutions.

No Time to Eat Between Classes? I expect students to have had something to eat prior to class, but I am also aware that some classes, such as choir rehearsals and athletic practice give students very little time to have dinner before class. If you fall into this category, grab something to eat at

the HUB or another location and come directly to class to eat your meal so you can be on time when astronomy class begins.

Snacks and Beverages: No snacking in class unless it is a medical necessity. If you have a health issue involving the necessity to consume food, you will be expected to provide authentication from a physician or the Health Center. Water is preferred, but I will be a little more tolerant here. If you spill a sugared, carbonated drink, please be considerate of others and clean up the spill thoroughly. Sticky floors in movie theaters have always aggravated me. I do not want that in Room 106.

Astronomical Observation Sessions: When the weather permits, class observations will be made from the Collier Sky Deck to view the International Space Station or other events. Conditions on the Sky Deck can be windy and cold, especially during late fall and early spring. On clear nights when longer observation sessions are held, students are expected to bring to class the extra clothing protection needed for the head, hands, and feet in addition to the regular outdoor winter clothing worn during the cold weather seasons.

Class Length and Breaks: Classes are from 6:00 p.m. to 9:00 p.m. Breaks will be on a need-to-have basis. When a break does not occur, students will be compensated for the extra time spent in class with a free night. Students must accumulate 160 additional minutes of instruction for this to happen. Some classes, such as observational sessions, will exceed the regular class length. Later class start and end times will occur to accommodate later sunsets when making astronomical observations during the instrumentation portion of the course when the telescopes are used.

Style of Classroom Presentations: I like to keep classes lively and fresh by allowing students to freely and openly exchange information with their instructor. If you feel uncomfortable with a specific aspect of my teaching style, please let me know privately so we can discuss this matter and I can possibly adjust my presentation techniques.

Faculty Withdrawal of Students NOT Attending Class: Before the announced last day for students to withdraw with a "W," instructors may request an administrative withdrawal for a student absent from class without notification for three weeks or more. The request will be submitted to the registrar in writing. [NOTE: Emails count as writing.] The registrar will then consult with one of the academic deans on the appropriateness of the request. If a student's status changes from full-time to part-time due to the administrative "W," the bursar and financial aid offices will adjust the student's account appropriately for the time involved. Students who are absent with notification (for example, they are in the hospital) may not be withdrawn by the instructor.

Students with Disabilities: Moravian University strives to create a learning environment that is accessible to all students. If you are experiencing or anticipate experiencing disability-related barriers to learning in your courses, you should contact the Office of Disability and Accommodations (ODA) at oda@moravian.edu. If you are registered with ODA and have a current accommodation letter, please share your letter with your instructor as soon as possible so we can discuss how your adjustments will be implemented in this course. You must be registered with ODA to receive any academic accommodation not granted or offered to all

students equally. The ODA works with students confidentially and only discloses disability-related information on a need to know basis or with the student's permission. Contact **Tracy Urban**, Director of Disability and Accommodations (ODA), located on the top floor of the Reeves Library in Room 324, call 610 861-1401, or email oda@moravian.edu.

Managing Life Crisis and Finding Support: Should you encounter an unexpected crisis during the semester), contact the Office of the Dean of Students by submitting a referral to **Dr. Nicole Loyd**, loydn@moravian.edu for yourself or a peer in need of support. Examples of unexpected crises include securing food or housing, addressing mental health concerns, managing a financial crisis, and/or dealing with a family emergency. If you are uncomfortable doing so on your own, please know that I can submit a referral on your behalf. Kindly email me, beckerg@moravian.edu or schedule a meeting with me during student hours.

Title IX, Discrimination Statement: Moravian University faculty are committed to providing a learning environment free from sex/gender discrimination and sexual harassment/violence in accordance with Title IX of the Education Amendments of 1972.

Moravian University designates all faculty members as mandatory reporters of such disclosures to the Equal Opportunity and Title IX Coordinator, who will reach out to offer information, resources, and supportive measures. Reports of sex/gender discrimination and sexual harassment/violence can be made online anytime at https://www.moravian.edu/compliance-training-development/reporting. Please note that all information remains private and that the student is not obligated to respond to outreach. Faculty are strongly encouraged to consult the Equal Opportunity and Title IX Coordinator for guidance on how to follow up when a student discloses sex/gender discrimination and sexual harassment/violence on an assignment, through research participation, and/or other educational prompt (as opposed to direct disclosure).

While pregnancy discrimination must be reported, disclosures of pregnancy status alone do not. Pregnant students are encouraged to contact the Equal Opportunity and Title IX Coordinator at pregnancy@moravian.edu to ensure continued educational access through reasonable modifications. Additional information and resources related to pregnancy are available at www.moravian.edu/pregnancy.

Fully confidential reporting options include licensed professionals in the Counseling and Psychological Services (CAPS), as well as our Chaplain(s). Survivors of sexual violence are encouraged to seek immediate assistance from the Advocates for Survivors of Sexual Violence by texting or calling (484) 764-9242. For more information, including grievance procedures, please view the Equal Opportunity, Harassment, and Non-Discrimination Policy at www.moravian.edu/policy/harassment-discrimination.

Writing Center: All members of the Moravian University community are welcome to visit the Writing Center. Writing Center consultants work with papers and multimodal compositions for any class, at any stage of the writing process. If you need the services of the Writing Center, please visit https://moravian.mywconline.com/ to make an appointment. The Writing Center is located on the second floor of Zinzendorf Hall, a building that is not accessible to persons with

mobility impairments. If this situation impacts your ability to use the Writing Center, we will gladly make arrangements to meet with you in an accessible location.

Use of Artificial Intelligence: Students are encouraged to use AI tools to support their learning, understanding, and creative processes during their coursework. However, AI tools mustbe utilized responsibly and morally, adhering to the principles of academic honesty and originality that Moravian University strives to achieve.

Your Teaching Assistant will be Ashleigh Lauer, lauera@moravian.edu, 215-420-0730
Ashleigh is smart, dependable, and is an achiever. This will be Ashleigh's second semester in that capacity. She is an education major and hopes to become an elementary teacher. Ashleigh took PHYS-108 in the spring of 2025. Please take advantage of her astronomy expertise and university life experiences. Ashleigh is eager to assist when needed.

About Your Instructor:
Name: Gary Arthur Becker
Contact: **Mobile: 610-390-1893** / Moravian Office: 610-861-1476 (almost never there)
Email: beckerg@moravian.edu for school-related activities.
Home Page: www.https://astronomy.org/ (Moravian University Astronomy);
Education: William Allen High School, Allentown, PA (1968),
Kutztown Uni. (1972): B.S. (Sec. Ed. with two majors—Earth and Space Science/Geography); West Chester Uni. (1984): M.A. (Astronomy/Geology),
Hobbies: Astronomy, photography/astrophotography, writing, traveling
Teaching Positions: Allentown School District Planetarium (38 years), Kutztown University, Penn State University, Lehigh Carbon Community College, Moravian University (16 years)

Personal Philosophy of Education: The educational process should be enjoyable. Ideally, pupils should want to attend classes because of their innate curiosities. Teachers should try to create a classroom atmosphere in which the student feels emotionally at ease while, at the same time, learners are being academically challenged.

Student Responsibilities: Students should make an honest attempt to grasp the lessons and homework assignments. In class, pupils should play a positive role in gaining familiarity with the subject material. Most importantly, students should be honest with themselves, their peers, and teachers. In other words, no B.S., please!

AND THE REST WE WILL MAKE UP ALONG THE WAY, if necessary. This includes specific topics or activities that may be added or adjusted during the course.

NEED HELP? Please feel free to stay after class or arrive before class if you need extra help. If you are ill or are going to be late for class, you are responsible for contacting your instructor to see what you have missed. You can accomplish that through a text (610-390-1893), and email or through the Statement from Absence from Class Form. **Students can reach me at 610-390-1893 (mobile) or *beckerg@moravian.edu*.** PHYS-108 also has a teaching assistant who is more than capable of providing extra help if needed.

FORMULA FOR SUCCESS IN ASTRONOMY, PHYS-108:

Since you made it to Moravian University, you should know this already!

1. **Complete the exercises in your *Astronomy Survival Notebook* when assigned.** Skim through the chapters before they are discussed in class so that you will know what is considered important. Then, reread them after the class presentation. Answer the questions in the back of each chapter or review the lessons via the online lecture videos.
2. **Use your *Astronomy Survival Notebook*, Class Videos, YouTube Videos, Reeves Library, instructor, teaching assistant, and resource avenues.** I am ready and willing to assist you in any reasonable way to help you succeed in this course. In addition, you have a teaching assistant willing to help you. So, there is no excuse. Astronomy has been my life's vocation; my hobby started in Third Grade. I want this to be a positive experience for both you and me.
3. **Possess some mathematical skills** (at least through algebra). Don't be afraid of math. It's not my favorite subject either.
4. **Study for exams** over several days.
5. **Review the lecture slides** here. Remember that a picture is worth a thousand words.
6. **Participate** in classroom activities, take notes, and ask questions when in doubt. In other words, be an active learner and a team player.
7. **Complete assignments on time** and laboratory exercises in a neat and orderly fashion. If I cannot read it, I will not grade it.
8. **Attend class** regularly. You miss class, you miss out, and your grade will suffer—**guaranteed!**
9. **Communicate with your instructor** to keep him in the loop if there are problems or you are absent.
10. **Practice the Golden Rule: *Do unto others as you would have others do unto you***. Treat me respectfully, and I will have no trouble returning the same favor to you. Cooperation and community are essential aspects of the learning environment in my classroom.
11. **The Moravian University *Academic Code of Conduct* applies to all students, especially to those who feel that cooperation, responsibility, respect, and tolerance ARE NOT crucial to the educational process.** Kindly remember that ***EDUCATION IS NOT A DEMOCRACY***, but it does not have to be an autocracy or dictatorship either**.**

Moravian University faculty are committed to providing a learning environment free from gender discrimination and sexual violence. Should a student disclose a concern of this nature, the faculty member is obligated to inform the Title IX Coordinator, who will assist the student in determining resources for support and resolution. Fully confidential reporting options include the Counseling Center, Health Center, and Religious Life (chaplain). Survivors are encouraged to seek immediate assistance by contacting the Advocates at (484) 764-9242. For more information, please visit www.moravian.edu/titleix.

January 9, 2026

NOTES

General Blue

2026

January

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February

S	M	T	W	T	F	S
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March

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29	30	31				

April

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19	20	21	22	23	24	25
26	27	28	29	30		

May

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31						

June

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July

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26	27	28	29	30	31	

August

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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

September

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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

October

S	M	T	W	T	F	S
				1	2	3
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11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

November

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

December

S	M	T	W	T	F	S
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

2025-2026 ACADEMIC CALENDAR

FALL TERM

Classes Begin	Monday, August 25, 2025
Add/Drop Ends	Friday, August 29, 11:59 PM EST
Labor Day (Classes held, Offices open)	Monday, September 1
Heritage Day (Classes held after 4pm)	Wednesday, September 17
Fall Break (No Classes held)	Saturday, October 4 – Tuesday, October 7
Midterm Grades Due	Friday, October 10 by 12:00pm (noon)
Spring/Summer '26 Priority Registration Opens	Monday, October 20
Last Day for Course Withdrawal 'W'	Friday, October 31 by 11:59 PM EST
Thanksgiving Break (No Classes held)	Wed., November 26 – Sunday, November 30
Classes End	Saturday, December 6
Reading Day	Sunday, December 7
Final Examinations	Monday, December 8 – Friday, December 12
Final Grades Due	Monday, December 15 by 12:00 PM EST (noon)

WINTER SESSION (2 Weeks)

Classes Begin	Monday, January 5, 2026
Add/Drop Ends	Second Day of Course by 11:59 PM EST
Last Day for Course Withdrawal 'W'	Friday, January 9 by 11:59 PM EST
Classes End	Saturday, January 17
Final Grades Due	Monday, January 19 by 12:00pm EST (noon)

SPRING TERM

Term Begins	Monday, January 19, 2026
Martin Luther King Day (No Classes held, Offices Closed)	Monday, January 19, 2026
Classes Begin	Tuesday, January 20, 2026
Add/Drop Ends	Friday, January 23, 11:59 PM EST
Spring Break	Sunday, March 8 - Sunday, March 15
Mid-Term Grades Due	Friday, March, 20 by 12:00pm EST (noon)
Fall '26/Winter '27 Priority Registration Opens	Monday, March 23
Easter Recess (No Classes held, Offices Closed)	Friday, April 3 – Sunday, April 5
Last Day for Course Withdrawal 'W'	Monday, April 6 by 11:59 PM EST
Classes End	Saturday, May 2
Final Examinations	Sunday, May 3 – Thursday, May 7
Baccalaureate	Friday, May 8 at 5:00pm
Commencement	Saturday, May 9
Final Grades Due	Tuesday, May 12 by 12:00pm EST (noon)

E X T R A C R E D I T A S S I G N M E N T S
MORAVIAN UNIVERSITY ASTRONONY—PHYS-108
NO EXTRA CREDIT WILL BE ALLOWED THIS SEMESTER

Rationale: Extra credit assignments are voluntary, student-driven, and designed for individuals who are achieving at levels considered average or above average. In PHYS-108, that rank is 75 percent or higher. Students achieving below this grade must concentrate and improve on the core learning objectives and lab assignments before attempting extra credit. Do not consider extra credit until after the first exam.

Extra Credit dividends will be in the form of Free Points, not to exceed more than five percent of a student's final grade. Fifteen free points will be considered the base number. This credit will assume that there are 300 points accumulated during the semester. If less than 300 points are accrued during the grading period, the extra credit points will not be lessened.

- A maximum of ten points for the successful completion of the project.
- Students will receive a maximum of five points for turning the completed project into a ***StarWatch*** article that will be considered for publication.

Suggestions for an Extra Credit Project:

- Term paper: including bibliography, footnotes, library (book/magazine) research, and the Internet. The length of the body of the presentation. Excluding citations will be 750-1000 words.
- An art project: Creative art projects should be sophisticated and astronomically accurate. The project must accompany a written explanation, including citations and the final piece of art must be shown and explained to the class. (Art-Photography Majors/no ***StarWatch*** article)
- An original musical composition or arrangement: The theme of the composition will have to have astronomical content, including written objectives, the musical score, a recording of the musical score, and a performance given to the class (Music Majors/no ***StarWatch*** article).
- An oral presentation about an astronomical topic (15 minutes minimum) can be given, including a subject outline, diagrams, illustrations, etc., which could be a PowerPoint presentation.
- A lesson plan with demonstrable objectives and outcomes can be created and given to the class (Education Majors only).
- Students may construct an astronomical device or model (10 points) and write a ***StarWatch*** article (15 points).
- Make a systematic series of observations of the day or nighttime sky over several weeks (10 points), with a ***StarWatch*** article (15 pts).
- An original short story with an astronomical theme including bibliography, footnotes, library (book/magazine) research, as well as the Internet (10 points/no ***StarWatch*** article)
- Your suggestions, as long as they follow the guidelines, relate to astronomy or your planned vocation and astronomy.

Seriousness of Purpose: Since this is a voluntary exercise, students are expected to be purposefully engaged toward achieving a successful end-result for their project. Students who do not apply themselves in a serious fashion to this purpose risk receiving no credit for their efforts. Consider the following as mandatory items found on the next page:

- Formulating a written thesis statement regarding the chosen topic, presenting this to the instructor, and remaining on task with respect to its fulfillment.
- Keeping the instructor informed of progress during the assignment and implementing suggestions to improve the mission.
- On time completion of the assignment.

MINI-TERM PAPER

(Extra credit or as assigned)

1. **Subject:** Any topic that has a direct application to astronomy.
2. **Length:** Two to three pages (750-1000 words).
3. **Format:** Microsoft Word, New Times Roman font, 14 point, double spaced, one-inch margins, bibliography and footnotes where applicable (not included in page count).
4. **Weight:** 15 points which includes a ***StarWatch*** article.
5. **Grading:** See below.
6. ***StarWatch* articles** must fit template, New Times Roman font, 12 point, no exceptions.

Name _____ Date _____

Title of Paper _____

Grade: 15 pts. - _____ +/- _____ = _____
Checklist Special Considerations Final Grade

DETERMINATION OF GRADE

WRITTEN COMMENTS

CLARITY AND ACCURACY:

1. Material organized improperly ------- _____
2. Information does not make sense ---- _____
3. Out of date information ---------- _____
4. Incorrect facts, repetitive ---------- _____
5. Incomplete explanations---------- _____
6. No introduction —No conclusion----- _____
7. Proofreading needs improvement----- _____

Total point value equals 7---------- _____

ENGLISH:

8. Spelling errors—Capitalization------ _____
9. Grammar-Punctuation---------- _____
10. Awkward sentences ---------- _____
11. Bibliography style incorrect --------- _____
12. Footnote needed or style incorrect -- _____

Total point value equals 5---------- _____

NEATNESS:

13. Title page missing. ---------- _____
14. Paper appears sloppy ---------- _____
15. Paper not double-spaced ---------- _____
16. Paper not typed ---------- _____

Total point value equals 3---------- _____

Special Considerations:

StarWatch 1115

for the week of December 31, 2017

Moravian Donor Attains Immortality

On January 1, 1801, Giuseppe Piazzi (1746-1826), an Italian astronomer on the island of Sicily, was compiling a new star catalog. Piazzi noted the position of a luminary that was not present the next night. However, he observed a similar star near the original star's location. * Giuseppe initially thought he had discovered a new comet; it was a new planet. He named it Ceres for the Roman goddess who gave agriculture to humankind. Then another "planet," Pallas, was discovered on March 28, 1802, and another on September 1, 1804. A fourth "planet" came into telescopic view on March 29, 1807. * It became apparent after Pallas that these objects were representative of a new classification of smaller solar system bodies called asteroids (little stars). By the early 1990s, astronomers knew of thousands, and a few dozen had orbits that crossed the Earth's path and could create havoc if they impacted. * Then, on March 24, 1993, Eugene and Carolyn Shoemaker and David Levy made a startling discovery. Calculations showed that Comet Shoemaker-Levy 9 was fragmented and in orbit around Jupiter and would hit Jove between July 16-22, 1994. The enormity of the energy released by the 20 impacting fragments dwarfed all expectations made by professional astronomers. It set into motion a concerted effort by experts to discover and map the orbital paths of as many asteroids as possible to find all Earth-crossing members. Today, we know of over 16,000 of them. * Most are negligibly small, about 7000 large enough to create localized damage, including the loss of life. Eleven hundred are more extensive than 0.6 miles and could create real problems if they struck the Earth. * The heyday of asteroid discoveries by amateurs was in the late 90s, and it was at this time (1997) that James Robinson Bruton, a former student of Kutztown University astronomy professor and Moravian donor, Dr. Carlson R. Chambliss, discovered two asteroids, one of which he named after Carlson Chambliss. Carlson was also my astronomy professor when I studied at Kutztown University (1968-72). Chambliss has underwritten about half of the funding for Moravian's 25 percent timeshare for the MDRS Robotic Observatory near Hanksville, Utah. Jim was also my student teacher at the Allentown School District Planetarium during the fall semester 1983. His genuine interest in astronomy and unique perspectives in teaching complex concepts earned him an outstanding evaluation. * When Jim first observed 23707 Chambliss on October 4, 1997, he worked as a science teacher in Chinle, Arizona, on a Navajo reservation. This non-spherical, main belt silicate asteroid, 7.198 km at its greatest length (4.5 mi.), has an orbital period of 5.53 years. It rotates once every 5 hours, 4 minutes. More importantly, 23707 Chambliss has been modeled photometrically. We know its general shape, and if you would like to see it for yourself, go here. If you are into immortality, having an asteroid named for you is a wonderful way to be celebrated. Congratulations, Dr. Carlson R. Chambliss, on this exceptional and deserved honor. Ad Astra!

© Gary A. Becker – beckerg@moravian.edu
Moravian University Astronomy - astronomy.org

M O R A V I A N U N I V E R S I T Y A S T R O N O M Y

STUDENT INFORMATION SHEET

Today's Date_____

Name _____ Phone_____

Email address _____ Student ID Number _____

Major _____ Fresh/Sophomore/Junior/Senior Age_____ Access to a car? Y / N

Did you take Astronomy PHYS-108 based upon the recommendation of someone else? Y / N

If your answer was "yes," who was that person _____

Hobbies or special interests: _____

_____

Present or proposed career: _____

Reasons for taking this course: _____

_____

_____

Is there anything special in astronomy that you would like to learn while taking this course?

_____

What qualities do you like to see in a teacher? _____

_____

Check the following math courses that you have successfully completed, including those in which you are currently enrolled:

_____Algebra I _____ Algebra II _____ Algebra III _____ Geometry

_____ Trigonometry _____ Analytical Geometry _____ Calculus _____ Computer Science

Specify other math courses not included above: _____

Specify your attitude towards math: _____

I have read and understand the information regarding classroom procedures. Name _____ Date _____

Print your name _____

Major, or area of interest: _____

1. What is the most memorable observation you have seen astronomically or in the sky?

2. What are your future hopes and dreams? Where do you see yourself in 10 years?

3. Describe yourself in **six words**.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

MEDICAL EXCUSE NOTE POLICY
Moravian University

Introduction:

A *Statement of Absence from* Class form can be found on the back of this paper or it can be requested by emailing your instructor.

Moravian University Rationale:

This policy is congruent with those campuses nationwide that recognize the adult relationship between university students and their instructors. Attendance/participation policies related to specific courses should be outlined in class syllabi and communicated to students by their instructors. Sickness is only one of the many reasons that a student may not attend class. Ultimately, attending class is the responsibility of a student. The Health Care providers at the Health Center cannot be expected to write excuse notes for illnesses or problems for which we have never provided care. A student request for a note stating "I was sick last week (or last month) and could not attend class" is unreasonable!

Moravian University Policy:

- An excuse note will be written only in a case where the student has been treated by one of our providers and they have deemed it necessary for the student to be out of class. Under no circumstances will the diagnosis be placed on the note unless requested by the student.

- If the illness is over a prolonged period (over 3 days) Learning Services will be notified who then in turn will email each of the student's professors. Details will only be given with the student's permission.

- Students frequently have medical, psychological conditions, illnesses or injuries that may cause them to miss class. These situations will be handled individually by our providers if they are involved in their care.

- In the event that a note is required by the professor in cases other than the above circumstances, the following form should be filled out by the student and given to their professors. The Health Center **WILL NOT** be involved.

STATEMENT OF ABSENCE FROM CLASS
Moravian University

1. Student's Name: _____
2. Department/Course: __Physics, PHYS-108, Astronomy_____
3. Date of Absence: _____
4. Instructor: __Gary A. Becker_____
5. Reason for Absence: _____
6. In case of absence due to illness, answer the following:
   - Did you visit the Health Center? _____
   - Did you see another Doctor? _____
   - Doctor's name _____
   - If your answers to (a) or (b) are "NO" please give the name of someone who can verify the fact that you were ill.

     Name of person: _____

     Phone number: _____

I certify that the above facts to be true to the best of my knowledge and belief. ***I give permission to my professor to verify that the above information is true.*** *Finally, I understand that I subject myself to disciplinary action in the event the above facts are found to be false.*

Signature: _____

Date: _____

Please be advised that falsifying excuses for an absence from classes, examinations, or other course requirements is considered a violation of the Academic Honesty Policy. Students found to have falsified an excuse will be charged with academic dishonesty. At a minimum, the penalty will be a zero for the assignment in question; however, course failure, suspension, or expulsion from the University, are other possible consequences of falsified absence notes.

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STATEMENT OF ABSENCE FROM CLASS
Moravian University

7. Student's Name: _____

8. Department/Course: __Physics, PHYS-108, Astronomy_____

9. Date of Absence: _____

10. Instructor: __Gary A. Becker_____

11. Reason for Absence: _____

12. In case of absence due to illness, answer the following:

- Did you visit the Health Center? _____
- Did you see another Doctor? _____
- Doctor's name _____
- If your answers to (a) or (b) are "NO" please give the name of someone who can vouch for the fact that you were ill.

  Name of person: _____

  Phone number: _____

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STATEMENT OF ABSENCE FROM CLASS
Moravian University

13. Student's Name: _____

14. Department/Course: __Physics, PHYS-108, Astronomy_____

15. Date of Absence: _____

16. Instructor: __Gary A. Becker_____

17. Reason for Absence: _____

18. In case of absence due to illness, answer the following:

- Did you visit the Health Center? _____
- Did you see another Doctor? _____
- Doctor's name _____
- If your answers to (a) or (b) are "NO" please give the name of someone who can vouch for the fact that you were ill.

  Name of person: _____

  Phone number: _____

I certify that the above facts to be true to the best of my knowledge and belief. ***I give permission to my professor to verify that the above information is true.*** *Finally, I understand that I subject myself to disciplinary action in the event the above facts are found to be false.*

Signature: _____

Date: _____

Please be advised that falsifying excuses for an absence from classes, examinations, or other course requirements is considered a violation of the Academic Honesty Policy. Students found to have falsified an excuse will be charged with academic dishonesty. At a minimum, the penalty will be a zero for the assignment in question; however, course failure, suspension, or expulsion from the University, are other possible consequences of falsified absence notes.

MORAVIAN UNIVERSITY

1200 MAIN STREET
BETHLEHEM, PA 18018-6650
610-861-1300/www.moravian.edu

All PHYS-108 Astronomy Students Must Complete and Sign

MORAVIAN COLLEGE WAIVER

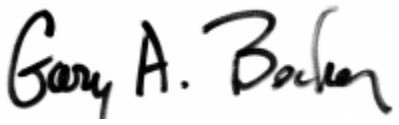
Name of Individual (Print) _____

Description of Activity: Field Experiences related to coursework in PHYS-108 Astronomy

Date of Activity: See PHYS-108 astronomy syllabus where dates and times, including rain dates are given for specific events. Additional dates may be necessary depending upon weather conditions.

Issuing Department: Physics

In consideration of my participation in the activity, listed above, on behalf of myself, my heirs, executors, administrators, successors, or assigns, I hereby release and forever discharge Moravian University, its agents, servants and employees of and from any and all manner of actions, causes of action, suits, damages, claims, and demands, on account of personal injury, including death, or any other cause whatsoever, which I may have against them by reason of or arising out of my participation in the above listed activity. I further release the University from any and all liability relating to expenses arising from my injury that may occur while I am participating in this activity.



_____ _____

Signature of Authorized Representative of the University Date

Moravian University Astronomy

_____ _____

Signature of Participant Date

_____

Printed Name of Participant

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All PHYS-108 Student Drivers Must Complete and Sign

ACKNOWLEDGEMENT OF RISK

Student Name (Print) _____ Age _____

A student of Moravian University participating in the following activity:

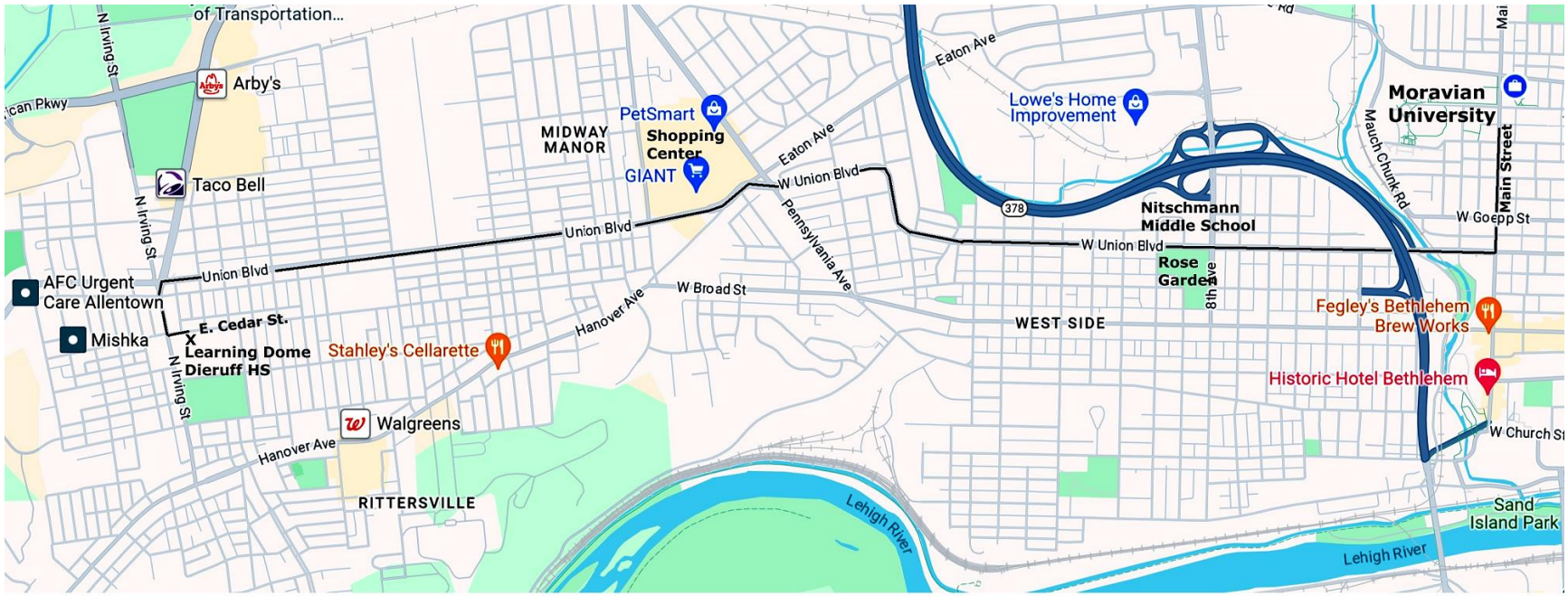
See PHYS-108 astronomy syllabus, where dates, times, and rain dates are given for specific events. Additional times may be necessary depending upon weather conditions.

_____

I will be using my personal vehicle as transportation to and from the above activity. I currently hold a valid driver's license. I understand that in using my own vehicle, I am traveling at my own risk. In the event of an accident, my own auto insurance will be the primary policy which will cover physical damage to my vehicle, as well as bodily injury and property damage to others. I hereby release and forever discharge Moravian University, its directors, agents, servants, and employees of and from any and all manner of actions, causes of action, suits, damages, claims, and demands, on account of personal injury, including, death, or any other cause whatsoever, which I may have against them by reason of or arising out of my participation in the above listed program.

_____ _____
Signature of Student Driver Date

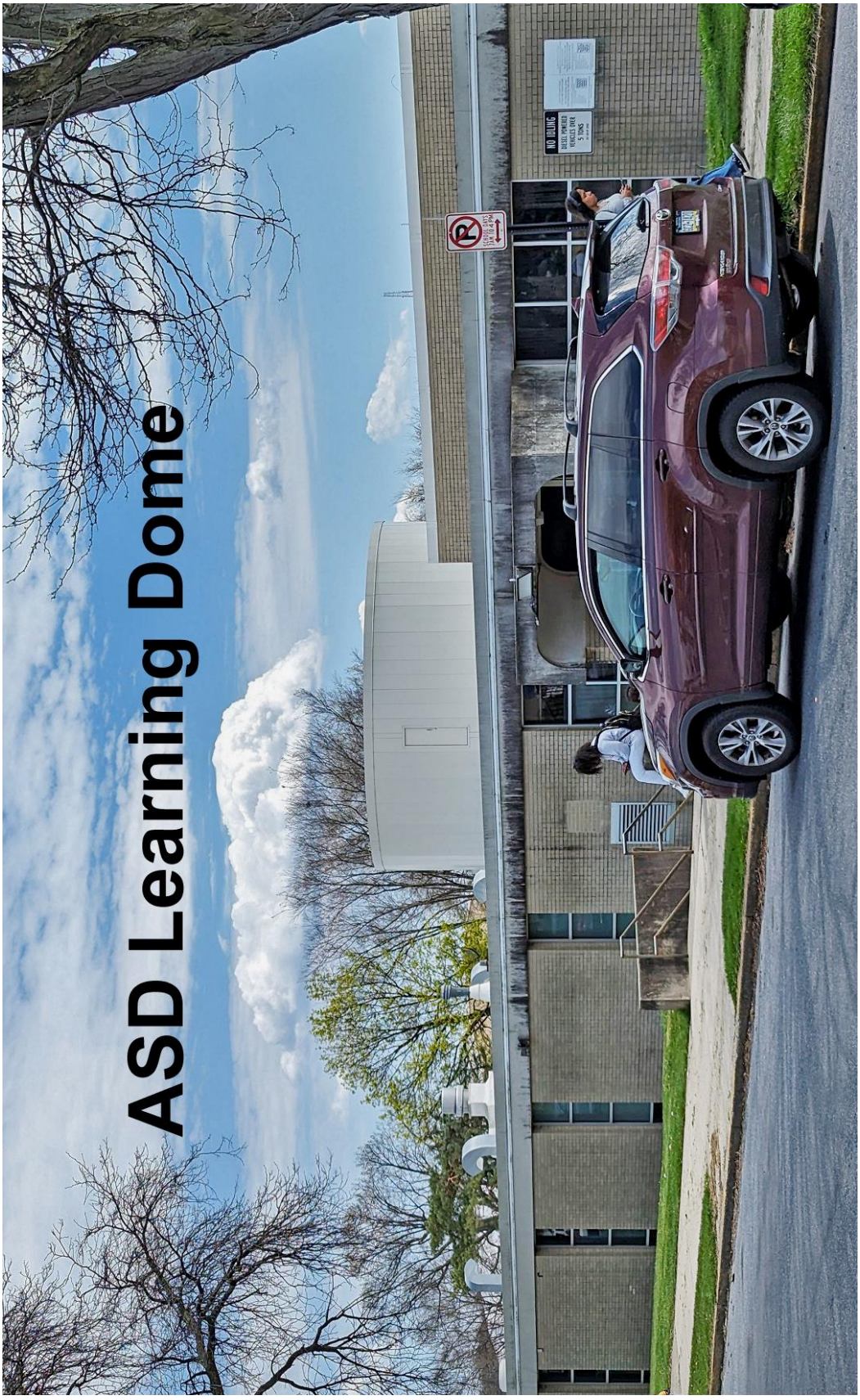
_____
Printed Name of Student Driver



Directions to Dieruff HS Learning Dome from Moravian University

(Approximate distance is between 4-5 miles)

1. **From N. Moravian Campus, drive south on Main Street to Union Blvd.**
2. **Make a right onto Union Blvd.**
3. **Follow Union Blvd. past a shopping center to the very large Union Blvd.-Airport Road intersection. Stay left. There is a big gas station on the right.**
4. **Turn left onto North Irving Street. Drive one block. Dieruff is ahead and to the left.**
5. **Left onto East Cedar Street. Proceed 100 feet (North boundary of Dieruff H. S. campus).**
6. **Look for cylinder type structure on the roof of Dieruff High School. That's the dome support for the ASD Learning Dome. Park on the street. Enter the doors closest to the Learning Dome on East Cedar Street. Usually the far right door is the one that is open.**


ASD Learning Dome
NO IDLING
DIESEL POWERED VEHICLES OVER 5 TONS

Moravian University-Astronomy PHYS-108

(Earn Some Free Points)

Name _____ Date _____

What is it?

Instructions: Ensure all components of this exercise are answered for full credit. You will receive no credit if you fail to give the date or state your first and last name. You will be graded on sections one (80%) and two (20%). The maximum credit will generally be one free point. Remember, if I cannot read it, I will not grade it. Spelling does not count. Thanks!

1. **Please describe what you are viewing in detail: DON'T TELL ME WHAT IT IS HERE. Please give me the details. What does it look like? DRAW A PICTURE. What are its dimensions (use a ruler)? Give details about color(s), texture (How does it feel to the touch), shape, weight, density (light or heavy for its volume), composition (chemical makeup), transparency/translucency/opaqueness, etc. You can use stream of consciousness, sentences, or bullets. Write clearly.**

2. **What is it? If you can identify the object, this is the place to do it. If not, make a guess. Remember, that moon rocks are way above my pay grade.**

Moravian University-Astronomy PHYS-108

(Earn Some Free Points)

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