



## **Astr 420.01E: Galaxies and Cosmology**

COURSE SYLLABUS: Spring 2024

**Class Location:** TTh 9:30 AM - 10:45 AM, McFarland Science Building 146

### **INSTRUCTOR INFORMATION**

Instructor: Dr. Kurtis A. Williams, Associate Professor

Office Location: Room 106A, McFarland Science Building

Student Hours:

MW 11:00-Noon

TTh 1:30-2:30

By Appointment (<http://kurtiswilliams.youcanbook.me>)

Virtual Office Hours:

By Appointment (<http://kurtiswilliams.youcanbook.me>)

University Email Address: [Kurtis.Williams@tamuc.edu](mailto:Kurtis.Williams@tamuc.edu)

Preferred Form of Communication: **email**

Office Phone: (903) 886-5488

Communication Response Time: Before the end of the following business day

Preferred Pronouns: He/him/his

### **COURSE INFORMATION**

#### **Materials – Textbooks, Readings, Supplementary Readings**

##### **Required Textbook**

- [Introduction to Modern Astrophysics](#), 2<sup>nd</sup> Ed., 2017 printing, by Carroll and Ostlie, published by Cambridge University Press. ISBN: 9781108422161

##### **Software Required**

- Access to a programming language and compiler. Suggested: python3, such as anaconda. A more detailed recommendation will be made in class.

### **Course Description**

*Hours:* 3

The basic observations, physical properties, and evolution of galaxies, active galactic nuclei, and large scale structure. Topics also include the Big Bang theory, basic equations of cosmology, inflation, dark matter and

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dark energy, and observational techniques used in testing these hypotheses. Prerequisites: Phys 321 or Phys 333

In this course, we will explore the basic properties and structure of the Milky Way and other nearby galaxies. We will then enter into basic cosmology and the Big Bang before ending with the modern frontiers of cosmology and remaining enigmas of dark matter, dark energy, and the pre-Big Bang universe.

In this course we will focus on learning the vocabulary, observations, and mathematics that are necessary to develop an intuitive understanding of the basic physical properties and physical processes behind galaxies and modern cosmology.

***No previous astronomy courses? No problem.***

You need no prior astronomy or astrophysics courses to succeed in this course. You do need to have completed at least University Physics I and II, at least one 300-level physics course, and Calculus III (concurrent is okay).

**Student Learning Outcomes**

1. Students will explain common astrophysical terms, basic concepts, and theories for a variety of galactic and extragalactic astrophysical phenomena.
2. Students will develop basic computational skills in numerical analysis and graphical interpretation of physical systems through astrophysical problem solving.
3. Students will enhance their technical communication abilities by reading modern astrophysical literature and presenting summaries thereof to their classmates.

**COURSE REQUIREMENTS**

**Minimal Technical Skills Needed**

You will need to conduct calculations and create graphical representations of equations and numerical data using computer software of your choice. A detailed recommendation for a python environment will be made closer to the start of classes. Dr. Williams is most comfortable in ancient programming languages such as Fortran BASIC, and IDL, but can also help some with Python. Any other languages and you will need to find your own support.

You must be familiar with basic web usage and how to save web-based data to your drive. You will need to be able to read PDF documents and to create Microsoft Word documents, plain text files, or PDF files. You will need to be able to access class information from myLEO Online (D2L).

**How To Get Started**

**myLEO Online Access Information**

This course uses myLEO Online, the new learning management system at A&M-Commerce. All materials, assignments, and resources will be made available through this system. To access this course, go to: <http://myleoonline.tamuc.edu>. Log in with

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your myLEO account and password. Then click on the link to [Spring 2024 Galaxies and Cosmology](#) to get to our course.

### **How This Course Is Organized**

This course is organized by units roughly corresponding to chapters in the textbook. You should listen in class and check the course page on MyLeo Online often to see what activities and assignments are coming due and how they relate to specific chapters in the textbook or other online materials.

### **What Should You Do First?**

After attending class and reading this syllabus, you should proceed to the course page on MyLeo Online and familiarize yourself with the resources. Next, order the course materials if you haven't yet.

## **Instructional Methods**

### **Attendance and Participation**

Research into how people learn shows that the best learning comes from interaction. Simply reading material and listening to me drone on won't help you learn anything useful. To learn, you must take the material, work with it, and make it your own. I therefore will require you to participate actively in the course. Your participation will be key to your success in the course.

For these reasons, attendance and class participation are mandatory and will count toward your final grade.

### **Exams**

There will be one midterm exam and one final exam for this course. Formula sheets will be provided, and you will likely want to have a calculator.

### **Homework Assignments**

Homework will be assigned often and will consist of a mixture of problem types. Some may require small amounts of computer programming and/or computer generated plots and graphs.

Homework grading will be based on the rubric described under "Grading" below. Very important to notice is that homework grades will often not be graded just on you obtaining the correct answer, but also that you show evidence of understanding how to get that answer; partial credit is highly dependent on this evidence as well. I therefore suggest you annotate your work in order to tell me what you are trying to do (and, if appropriate, why).

I encourage you to work with each other in solving problems – that's just how science is done! When you work together, try to ensure first and foremost that everyone has the correct physical insight into the problem; don't simply share answers. Again, correct

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answers are only part of your assignment grades. Also, don't simply copy another person's full solution to a problem – it will be obvious to me.

The following are considered cheating and will not be tolerated: Directly copying text from a website or other printed source, obtaining copies of solutions to homework questions (whether from past students or other sources), directly copying another student's work, the use of generative AI (unless specifically permitted in an assignment), etc. See the section on "Academic Integrity" below for full details.

### **Presentations and Written Reports**

Over the course of the semester, you will need to read assigned astronomical literature and summarize the crucial points, both verbally for your classmates and in written reports. Details will be provided during class.

### **Extra Credit:**

There is no extra credit available for this class.

## **Student Responsibilities and Tips for Success in the Course**

Students who do well in this course share most of the following common habits:

- Arriving a couple minutes early for class and not leaving until class is dismissed.
- Not using phones, tablets, or computers during class
- Checking MyLeo often for announcements and assignments
- Completing all assignments on time
- Asking for help and advice early in the semester
- Taking responsibility for their own grade.

## **GRADING**

Final grades in this course will be based on the following scale:

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = 59% or Below

Letter grades are based on an absolute scale with no competition. If you all earn an A, you all get an A. I may "curve" grades for specific assignments at my discretion; your percentage earned will never go down if I apply such a curve. Your current grades are available through the gradebook on myLEO Online – look for "Total Calculated Grade."

Grades are based on a weighted system. The categories and weights are:

Classroom Participation: 10%

Exams: 40%

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Midterm Exam: 20%  
Final Exam: 20%  
Homework Assignments: 40%  
Presentations and written reports: 10%

## TECHNOLOGY REQUIREMENTS

### LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

[https://documentation.brightspace.com/EN/brightspace/requirements/all/browser\\_support.htm](https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm)

Zoom Video Conferencing Tool

[https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom\\_Account.aspx?source=universalmenu](https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom_Account.aspx?source=universalmenu)

## ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or [helpdesk@tamuc.edu](mailto:helpdesk@tamuc.edu).

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

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## Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

## Interaction with Instructor Statement

### Email:

I can be reached by email at [Kurtis.Williams@tamuc.edu](mailto:Kurtis.Williams@tamuc.edu). Please put “Advanced Galaxies” in your email subject header. It may take me up to 24 hours to send you a response (48 hours on the weekend or holidays). If you don’t hear back from me in that time, please send another email or give me a call.

### Text Messaging:

Students may feel free to contact me via text message; the instructor’s phone number will be given out in person. Please don’t share it with others unless you get Dr. Williams’s permission first.

I have also created a Discord server for this course; invites will be forthcoming. Please follow appropriate e-etiquette or you may find yourself banned from the server.

**Office Hours:** Office hours are available in both real-world and virtual formats. Office hours are times that I set aside when I promise to be in my office so that you can come by and talk to me. During office hours, you can ask questions about the course material, ask about homework, see your current grade, or ask other questions about the class or astronomy in general.

It’s important to realize that office hours are *not* just for students who are having problems in the course. If you are uncertain about anything, please visit, email, phone or drop into virtual hours before your small problems grow into big ones. If you are worried about what might be on the test, stop in. If you are curious about astronomy jobs and research opportunities, come by.

Office hours work best if you have your textbook, notes, and homework sets with you.

If you want to talk but cannot come during office hours, please go to <http://kurtiswilliams.youcanbook.me> to schedule an appointment; this scheduling app will allow you to choose if you wish to speak to me face-to-face or by Zoom, and it allows you to reschedule or cancel appointments 24/7.

You may feel free to stop by my office any time my door is open, but if you do not have an appointment and if it is not my scheduled office hours, please understand if I’m not free to talk at that instant.

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## Social Media:

Please don't follow me on social media until after you've graduated. You'll be disappointed anyway.

# COURSE AND UNIVERSITY PROCEDURES/POLICIES

## Course Specific Procedures/Policies

### Academic integrity

A major goal of this and most every university course is for you to learn and appreciate subject material. Academic dishonesty ("cheating") actively prevents you from achieving this goal. Academic dishonesty is taken seriously by the University and by me, and **will not be tolerated.** (See the TAMU-C Code of Student Conduct and the TAMU-C Procedures A 13.04, 13.12, 13.31, and 13.32.)

This conduct is not only considered wrong in this course and at this University, but also in the real world. Engaging in these activities will get you fired from a job and prevent you from getting another job.

Unethical student conduct includes:

- **Plagiarism**, or copying the words of others with the intent of making it look like your own. Whether you use someone else's phrase word for word, or whether you try and change a few words, or even if you just borrow someone else's original idea and don't give them credit, that's unethical. Use your own words whenever possible, give credit to wherever you got an idea, and put direct quotes inside quotation marks.
- **Cheating** involves trying to trick me or others into thinking you did work that you really didn't do, or into thinking you know what you really don't know. This can include stealing exams, changing your answers on a graded exam or assignment and claiming it was graded wrongly, putting your name on someone else's homework, and so on.
- **Searching the Internet for homework solutions and entering answers you find** is considered cheating. Searching the Internet for help on a topic is okay. For example, suppose a question asks, "Describe the life cycle of a star that has the same mass as the sun." Typing that phrase into Google and cutting and pasting the text in the answer box is considered cheating. Typing "star life cycles" into Google, reading a few web pages, and summarizing the information in your own words is not cheating.
  - The use of generative AI, such as Chat GPT, is only permitted when an assignment explicitly asks you to use it.
- **Borrowing another person's work** is considered cheating. "Borrowing" includes looking at someone's submitted homework, Smartwork accounts, graded exams, screen shots, etc. with or without their permission. "Another person" includes not only present and past students, but also anyone else who might have access to solutions.
- **Collusion** is working with another person to cheat. This can include copying

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someone else's answers to an exam or assignment, doing work for another student, buying or otherwise obtaining homework/exam solutions from any source online or off-line, or any other instance of multiple people engaging in some form of cheating or dishonesty. Working with other students on an assignment is fine as long as everyone contributes and each student does their own work.

- **Any other activity that, to a reasonable person, looks wrong.** If you have any doubt whatsoever whether a certain action is considered dishonest, please ask me *before* engaging in the activity. There is no need to be embarrassed about asking, and I won't penalize you for asking! In this class, if you follow the maxim "it's easier to beg forgiveness than to ask permission", don't expect forgiveness to be forthcoming.

***If you engage in academic dishonesty during any graded activity, you will receive no credit for that activity. More than one instance of dishonesty by a student will result in automatic failure of the course and referral of the student for disciplinary action.***

myLeo Online provides me with tools that check for common forms of online cheating and collusion. These include, but aren't limited to: time stamps, location stamps, and automated comparison of essay answers. I will use these tools.

### **Administrative Withdrawal**

Although I have the right to drop you for excessive absences (called "administrative withdrawal), I won't do so. You have a right to get an F if you decide to quit working but don't drop the course.

### **Assignment Policy and Due Dates**

Assignments and due dates will be posted in the MyLeo Online course calendar for each assignment. Submission requirements for each assignment will also be given on that page.

### **Dropping the Course**

You may drop this course by logging into your myLEO account and clicking on the hyperlink labeled 'Drop a class' from among the choices found under the myLEO section of the Web page.

### **Incompletes**

I only offer incompletes in extraordinary circumstances. Any student interested in an incomplete should contact me as soon as possible after the situation arises, and should keep in mind that I am not required to give you an incomplete and so may not offer you the opportunity. You should also know that you only have access to a myLEO Online course for two weeks following the final day of term.

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## **Late Work**

Late assignments are penalized 10% for each day late. After 7 days, late assignments will receive a zero. Exams may only be taken late by arrangement with the instructor, otherwise missed exams will receive a zero. The instructor has final discretion on whether to give a make-up exam. All work must be finished by the end of the day on the last day of classes.

## **Technical Issues**

Personal computer problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, many restaurants, Interstate Rest Areas, etc.

## **Syllabus Change Policy**

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

## **University Specific Procedures**

### **Student Conduct**

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the [Student Guidebook](http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx).  
<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum:  
<https://www.britannica.com/topic/netiquette>

### **Mental Health and Counseling**

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit [www.tamuc.edu/counseling-center](http://www.tamuc.edu/counseling-center)

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## **TAMUC Attendance**

For more information about the attendance policy please visit the [Attendance](#) webpage and Procedure 13.99.99.R0.01.

<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

## **Academic Integrity**

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

### [Undergraduate Academic Dishonesty 13.99.99.R0.03](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

Undergraduate Student Academic Dishonesty Form:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/documents/13.99.99.R0.03UndergraduateStudentAcademicDishonestyForm.pdf>

Graduate Student Academic Dishonesty Form:

<http://www.tamuc.edu/academics/graduateschool/faculty/GraduateStudentAcademicDishonestyFormold.pdf>

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

## **Students with Disabilities-- ADA Statement**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

### **Office of Student Disability Resources and Services**

Texas A&M University-Commerce

Gee Library- Room 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: [studentdisabilityservices@tamuc.edu](mailto:studentdisabilityservices@tamuc.edu)

Website: Office of Student Disability Resources and Services

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

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## **Nondiscrimination Notice**

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

## **Campus Concealed Carry Statement**

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Web url:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

### **AI use policy**

[Draft 2, May 25, 2023]

Texas A&M University-Commerce acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

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13.99.99.R0.03 Undergraduate Academic Dishonesty  
13.99.99.R0.10 Graduate Student Academic Dishonesty

### **A&M-Commerce Supports Students' Mental Health**

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit [www.tamuc.edu/counseling-center](http://www.tamuc.edu/counseling-center)

### **Sexual Harassment and Violence**

Violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc.

If you or someone you know is a victim of harassment, stalking, domestic violence, sexual assault, or related crimes, has been harassed or assaulted, here are some resources for you:

#### **24/7 Resources**

- National Domestic Awareness Hotline: 1-800-799-SAFE (7223)
- National Sexual Assault Hotline: 1-800-656-4673
- National Suicide Prevention Lifeline: 988

#### **Campus Resources**

- **Call 911 in emergency situations**
- If you or someone you know has been impacted and needs support, email: [VictimSupport@tamuc.edu](mailto:VictimSupport@tamuc.edu) (monitored Monday-Friday, 8am-5pm)
- Victim Advocacy and Support: <https://www.tamuc.edu/student-advocacy-support/victim-support-services/>
- How to Help and Report: <https://www.tamuc.edu/student-advocacy-support/victim-support-services/>
- How to Report Concerns About a Fellow Student: [https://cm.maxient.com/reportingform.php?TAMUCommerce&layout\\_id=20](https://cm.maxient.com/reportingform.php?TAMUCommerce&layout_id=20)
- University Title IX Compliance Office: <https://www.tamuc.edu/titleix/>
- University Title IX Contact: Amanda Berry, 903-886-5991, [titleix@tamuc.edu](mailto:titleix@tamuc.edu)
- University Police Department Sexual Assault pages: <https://www.tamuc.edu/university-police-department/crime-prevention/>
- University Counseling Center: <https://www.tamuc.edu/counseling-center/>
- Campus police email: [upd@tamuc.edu](mailto:upd@tamuc.edu)

#### **External resources:**

Crisis center of Northeast Texas: <http://www.cnetx.org>

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Know your IX: <http://knowyourix.org>  
End rape on campus: <http://endrapeoncampus.org>  
Clery Center for Security on Campus: <http://clerycenter.org>  
Not Alone: <http://changingourcampus.org/about-us/not-alone/>

## COURSE OUTLINE / CALENDAR

The course will cover many of the topics outlined below. Exact dates will be announced as the semester progresses.

Note: The textbook is used by not just advanced undergraduate astronomy classes but also graduate astrophysics classes. We will NOT be able to go over all of the material in each chapter, so please don't freak out when you look at each chapter!

Most work will focus on vocabulary, crucial qualitative relationships, and basic mathematical relations. We will not spend a lot of time on derivations and differential equations except when we can use them to understand what's going on.

*Chapter 4: The Theory of Special Relativity*  
*Chapter 5: The Interaction of Light and Matter*  
*Chapter 6: Telescopes*  
*Chapter 13: Main Sequence and Post-Main Sequence Stellar Evolution*  
*Chapter 24: The Milky Way Galaxy*  
*Chapter 25: The Nature of Galaxies*  
*Chapter 26: Galactic Evolution*  
*Chapter 27: The Structure of the Universe*  
*Chapter 28: Active Galaxies*  
*Chapter 29: Cosmology*  
*Chapter 30: The Early Universe*

### Important Class Dates:

- Jan 11: First Day of Class
- March 11-15: **No Classes** (Spring Break)
- April 30: **Last Day of Class**
- May 1-3: Final Exam Study Days
- May 6: **Final Exam**

**FINAL EXAM: May 9, 8:00 am – 10:00 am**

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